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Receiving Tube Manual

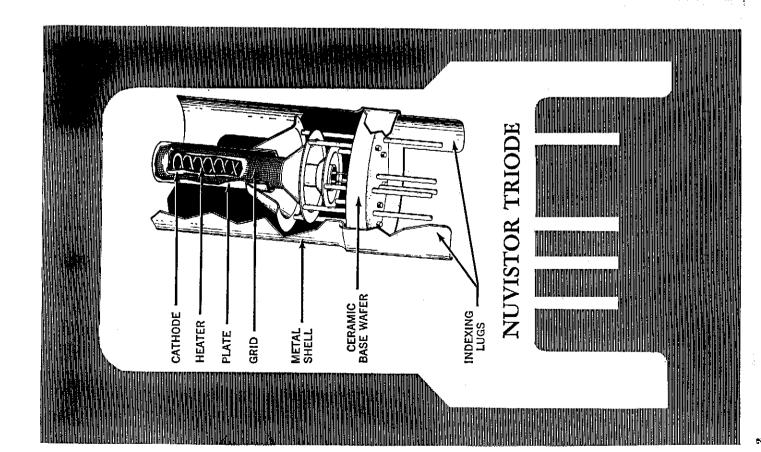
THIS MANUAL, like its preceding editions, has been prepared to assist those who work or experiment with home-entertainment-type electron tubes and circuits. It will be found valuable by engineers, service technicians, educators, experimenters, radio amateurs, hobbyists, students, and many others technically interested in electron tubes.

The material in this edition has been augmented and revised to include the recent technological advances in the electronics field. Many tube types widely used in the design of new electronic equipment only a few years ago are now chiefly of interest for renewal purposes. Consequently, in the Tube Types Section, information on many older types is limited to basic essential data; information on newer and more important types is given in greater detail.

RADIO CORPORATION OF AMERICA

ELECTRONIC COMPONENTS AND DEVICES

HARRISON, N. J.



Electrons, Electrodes, and Electron Tubes

The electron tube is a marvelous device. It makes possible the performing of operations, amazing in conception, with a precision and a certainty that are astounding. It is an exceedingly sensitive and accurate instrument—the product of coordinated efforts of engineers and craftsmen. Its construction requires materials from every corner of the earth. Its use is world-wide. Its future possibilities, even in the light of present-day accomplishments, are but dimly foreseen, for each development opens new fields of design and application.

The importance of the electron tube lies in its ability to control almost instantly the flight of the millions of electrons supplied by the cathode. It accomplishes this control with a minimum of energy. Because it is almost instantaneoperate efficiently and accurately at electrical frequencies much higher than those attainable with rotating machines.

Electrons

All matter exists in the solid, liquid, or gaseous state. These three forms consist entirely of minute divisions known as molecules, which, in turn, are composed of atoms. Atoms have a nucleus which is a positive charge of electricity, around which revolve tiny charges of negative electricity known as electrons. Scientists have estimated that electrons billionths of an ounce, and that they may travel at speeds of thousands of miles per second.

Electron movement may be accelerated by the addition of energy. Heat is one form of energy which can be conveniently used to speed up the electron. For example, if the temperature of a metal is gradually raised, the electrons in the metal gradually relocity. When the metal becomes hot enough, some electrons may acquire sufficient speed to

break away from the surface of the metal. This action, which is accelerated when the metal is heated in a vacuum, is utilized in most electron tubes to produce the necessary electron supply.

An electron tube consists of a cathode, which supplies electrodes, which control and collect these electrons, mounted in an evacuated envelope. The envelope may be made of glass, metal, ceramic, or a combination of these materials.

Cathodes

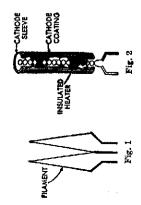
A cathode is an essential part of an electron tube because it supplies the When energy in some form is applied to is the form of energy generally used. The cathode, or heater-cathode, consists of a emitting material on its outside surface the cathode, electrons are released. Heat method of heating the cathode may be used to distinguish between the different sleeve. The sleeve carries the electronelectrons necessary for tube operation. ode, is a wire heated by the passage of an electric current. An indirectly heated filament, or heater, enclosed in a metal and is heated by radiation and conducforms of eathodes. For example, a directly heated cathode, or filament-cathtion from the heater.

A filament, or directly heated cathode, such as that shown in Fig. 1 may be further classified by identifying the filament or electron-emitting material. The materials in regular use are tungsten, thoriated tungsten, and metals which have been coated with alkalinearth oxides. Tungsten filaments are made from the pure metal. Because they must operate at high temperatures (a dazzling white) to emit sufficient electrons, a relatively large amount of filament power is required.

Thorated-tungsten filaments are made from tungsten impregnated with thorium oxide. Due to the presence of

therium, these filaments liberate electrens at a more moderate temperature flament power than are pure tungsten of about 1700°C (a bright yellow) and are, therefore, much more economical of

ribbon. This coating, which is dried in a as a coating on a nickel-alloy wire or relatively thick layer on the filament, ture of about 700-750°C (a dull red) to and require relatively little filament materials has special advantages which Alkaline earths are usually applied requires only a relatively low temperapreduce a copious supply of electrons. Coated filaments operate very efficiently power. However, each of these cathode determine the choice for a particular application.



Directly heated filament-cathodes power. They are used in almost all of eration because it is, of course, desirable to impose as small a drain as possible on require comparatively little heating 1U5, and 3V4. AC-operated types having directly heated filament-cathodes the batteries. Examples of battery-operated filament types are the 1R5, 1U4, the tube types designed for battery opinclude the 2A8 and 5Y3GT.

An indirectly heated cathode, or terial such as alkaline-earth oxides. The heater-cathode, consists of a thin metal sleeve coated with electron-emitting maemissive surface of the cathode is maintained at the required temperature (approximately 1050°K) by resistance-heating of a tungsten or tungsten-alloy wire

ing developed by RCA has better heat strength of the heater wire increases at the lower operating temperatures, tubes transfer than earlier aluminum-oxide coatings, and makes it possible to operate heaters at lower temperatures for given power inputs. Because the tensile using dark heaters have increased re-A new dark heater insulating coatiability, stability, and life.

The heater-cathode construction is well adapted for use in electron tubes intended for operation from ac power lines and from storage batteries. The use of functions, the electrical insulation of the ing effect of the sleeve may all be utilized introduction of hum from the ac heater supply and to minimize electrical inter-From the viewpoint of circuit design, separate parts for emitter and heater heater from the emitter, and the shieldin the design of the tube to minimize the erence which might enter the tube circuit through the heater-supply line. the heater-cathode construction offers cause of the electrical separation of the advantages in connection flexibility beheater from the cathode.

Another advantage of the heatercathode construction is that it makes practical the design of a rectifier tube having close spacing between its cathode ing close spacing between its cathode therefore, the regulation is improved. In an amplifier tube, the close spacing inrube. Because of the advantages of the and plate, and of an amplifier tube havcreases the gain obtainable from the and grid. In a close-spaced rectifier tube, the voltage drop in the tube is low, and, heater-cathode construction, almost all present-day receiving tubes designed for ac operation have heater-cathodes.

Generic Tube Types

tron tube unless they can be put to work. Therefore, a tube is designed with the parts necessary to utilize electrons as well as those required to produce them. These parts consist of a cathode and one or more supplementary elec-Electrons are of no value in an electrodes. The electrodes are enclosed in an evacuated envelope having the necessary connections brought out through air-tight seals. The air is removed from the envelope to allow free movement of

which is placed inside the cathode sleeve

and electrically insulated from it, as for the purpose of heating the cathode emitting temperature. Useful emission

shown in Fig. 2. The heater is used only sleeve and sleeve coating to an electrondoes not take place from the heater wire.

the electrons and to prevent injury to the emitting surface of the cathode.

When the cathode is heated, electrons leave the cathode surface and form Any positive electric potential within the evacuated envelope offers a strong Such a positive electric potential can be an invisible cloud in the space around it. attraction to the electrons (unlike elecsupplied by an anode (positive electrode) located within the tube in proxtric charges attract; like charges repel). imity to the cathode.

Diodes

shown in Fig. 3. Under the influence of an anode (plate), and is often called a diode, the family name for a two-elecsource connected between the plate The simplest form of electron tube contains two electrodes, a cathode and trode tube. In a diode, the positive potential is supplied by a suitable electrical terminal and a cathode terminal,

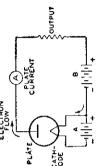


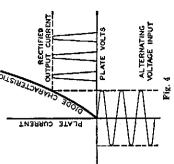
Fig. 3

return through the external plate-batpleting the circuit. This flow of electrons the positive plate potential, electrons flow from the cathode to the plate and tery circuit to the cathode, thus coms known as the plate current.

If a negative potential is applied to the plate, the free electrons in the space surrounding the cathode will be forced rent will flow. If an alternating voltage cause plate current flows only during the time when the plate is positive, current lows through the tube in only one direction and is said to be rectified. Fig. 4 duced by an alternating input voltage. back to the cathode and no plate curis applied to the plate, the plate is alternately made positive and negative. Beshows the rectified output current pro-

to de voltage for the electrodes of the Diode rectifiers are used in ac receivers to convert the ac supply voltage

can flow only during one-half of the tubes having only one plate and one cathode, such as the 35W4, are called half-wave rectifiers, because current plates and one or more cathodes are other tubes in the receiver. Rectifier alternating-current cycle. When = Electrons, Electrodes, and Electron Tubes ==



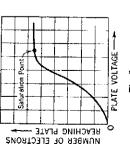
used in the same tube, current may be obtained on both halves of the ac cycle. The 6X4, 5Y3GT, and 5U4GB are examples of this type and are called full-wave rectifiers.

these conditions, the maximum number for a brief period to produce an effect known as space charge. This charge has pedes their passage to the plate. The exspace charge depend on the cathode cathode and the plate, and the plate potential. The higher the plate potential, repel other electrons. This effect may be noted by applying increasingly higher plate voltages to a tube operating at a creasingly higher plate voltages will succeed in attracting a greater propor-Not all of the electrons emitted by the cathode reach the plate. Some return to the cathode while others remain in the space between the cathode and plate a repelling action on other electrons which leave the cathode surface and imtent of this action and the amount of temperature, the distance between the the less is the tendency for electrons to remain in the space-charge region and fixed heater or filament voltage. Under of available electrons is fixed, but intion of the free electrons.

however, additional plate voltage has · Beyond a certain plate voltage, rent because all of the electrons emitted little effect in increasing the plate cur== Electrons, Electrodes, and Electron Tubes ==

by the cathode are already being drawn to the plate. This maximum current, illustrated in Fig. 5, is called saturation the total number of electrons emitted, it current. Because it is an indication of is also known as emission current or simply emission.

Although tubes are sometimes tested rent, it is generally not advisable to cause this value would be sufficiently Consequently, while the test value of by measurement of their emission curmeasure the full value of emission belarge to cause change in the tube's characteristics or even to damage the tube. emission current is somewhat larger than



quired from the cathode in the use of the tube, it is ordinarily less than the full The emission test, therefore, is used to indicate whether the maximum current which will be rethe cathode can supply a sufficient number of electrons for satisfactory operaemission current. tion of the tube.

If space charge were not present to make the effect of space charge small is cathode small. This method is used in at a lower plate voltage. One way to to make the distance between plate and rectifier types having heater-cathodes, tween cathode and plate is only about repel electrons coming from the cathode the same plate current could be produced such as the 5V4GA and the 6AX5GT. In these types the radial distance betwo hundredths of an inch.

vapor rectifier tubes. When such tubes zed, filling the space inside the bulb with mercury atoms. These atoms are Another method of reducing spacecharge effect is utilized in mercury. are operated, a small amount of mercury contained in the tube is partially vapor-

a sufficiently high speed, the collisions bombarded by electrons on their way to atoms. The mercury atom is then said to be "ionized," i.e., it has lost one or positive charge. Ionization is evidenced by a bluish-green glow between the curs, the space charge is neutralized by the plate. If the electrons are moving at tear off electrons from the mercury cathode and plate. When ionization octhe positive mercury atoms so that increased numbers of electrons are made available. Mercury-vapor tubes are used more electrons and, therefore, primarily for power rectifiers.

tion. These tubes are of the full-wave ing a reduced pressure of inert gas. The Ionic-heated-cathode rectifiers depend on gas ionization for their operadesign and contain two anodes and a coated cathode sealed in a bulb containcathode in each of these types becomes not during tube operation, but the heating effect is caused by bombardment of the cathode by ions within the tube rather than by heater or filament current from an external source.

The internal structure of an ionicheated cathode tube is designed so that when sufficient voltage is applied to the tube, ionization of the gas occurs beoperating voltages, ionization does not take place between the anode that is negative and the cathode so that the led. The initial small flow of current through the tube is sufficient to raise the descence whereupon the cathode emits ture. Proper operation of these rectifiers tween the anode which is instantaneously requirements for rectification are satiscathode temperature quickly to incanelectrons. The voltage drop in such tubes is slightly higher than that of the usual hot-cathode gas rectifiers because energy is taken from the ionization discharge to keep the cathode at operating temperarequires a minimum flow of load current at all times in order to maintain the cathode at the temperature required to positive and the cathode. Under normal supply sufficient emission.

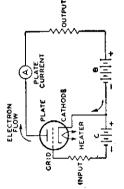
Triodes

When a third electrode, called the plate, the tube is known as a triode, the grid, is placed between the cathode and family name for a three-electrode tube.

from cathode to plate is practically unobstructed by the grid. In some types, a frame grid is used. The frame consists straps. Extremely fine lateral wire (digrid permits the use of closer spacings between grid wires and between tube The grid usually consists of relatively the cathode. The spacing between turns of wire is large compared with the size of the wire so that the passage of electrons ameter of 0.5 mil or less) is wound under tension around the frame. This type of electrodes, and thus improves tube perine wire wound on two support rods (siderods) and extending the length of of two siderods supported by four metal formance.

age is usually applied to the grid. Under is used as an amplifier, a negative de voltthis condition the grid does not draw ap-The purpose of the grid is to control the flow of plate current. When a tube preciable current.

and plate current decreases. When the The number of electrons attracted to the plate depends on the combined effect of the grid and plate polarities, as shown in Fig. 6. When the plate is positive, as is normal, and the dc grid voltage is made more and more negative, the plate is less able to attract electrons to it



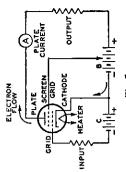
tively large amount of plate current, the three-electrode tube types are the 6C4 grid is made less and less negative (more rent increases. Hence, when the voltage a signal, the plate current varies with plied to the grid can control a comparasignal is amplified by the tube. Typical lly attracts electrons to it and plate curon the grid is varied in accordance with and more positive), the plate more readthe signal. Because a small voltage apand 6AF4A.

The grid, plate, and cathode of a triode form an electrostatic system, each

existing between grid and plate, plate desirable in an amplifier because it may capacitor. The capacitances are those and cathode, and grid and cathode. These capacitances are known as interelectrode capacitances. Generally, the capacitance between grid and plate is of the most importance. In high-gain radiofrequency amplifier circuits, this capacicoupling between the input circuit, the circuit between grid and cathode, and the output circuit, the circuit between plate and cathode. This coupling is uncause instability and unsatisfactory perelectrode acting as one plate of a small tance may act to produce undesired formance.

Tetrodes

plate capacitance. The effectiveness of grid (grid No. 2), in the tube. With the addition of the grid No.2, the tube has plate can be made small by mounting an additional electrode, called the screen is mounted between the grid No.1 (control grid) and the plate, as shown in Fig. 7, and acts as an electrostatic shield be-The capacitance between grid and four electrodes and is, accordingly, called a tetrode. The screen grid or grid No.2 tween them, thus reducing the grid-to-



this shielding action is increased by a screen grid and cathode. By means of the the grid-plate capacitance of a tetrode is made very small. In practice, the gridplate capacitance is reduced from several picofarads (pf) for a triode to 0.01 bypass capacitor connected between screen grid and this bypass capacitor,

over a certain range. The screen grid is practically independent of plate voltage The screen grid has another desirable effect in that it makes plate current operated at a positive voltage and, of or less for a screen-grid tube.

therefore, attracts electrons from the cathode. However, because of the comparatively large space between wires of the screen grid, most of the electrons drawn to the screen grid pass through it the same time the screen grid shields the to the plate. Hence the screen grid supplies an electrostatic force pulling electrons from the cathode to the plate. At electrons between cathode and screen grid from the plate so that the plate exerts very little electrostatic force on electrons near the cathode.

So long as the plate voltage is higher than the screen-grid voltage, plate current in a screen-grid tube depends to a great degree on the screen-grid voltage and very little on the plate voltage. The fact that plate current in a screen-grid age makes it possible to obtain much higher amplification with a tetrode than tance makes it possible to obtain this tube is largely independent of plate voltwith a triode. The low grid-plate capacireceiving-tube applications, the tetrode feedback and resultant instability. In high amplification without plate-to-grid has been replaced to a considerable degree by the pentode.

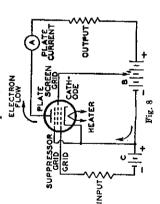
Pentodes

In all electron tubes, electrons striking the plate may, if moving at sufficient speed, dislodge other electrons. In twoand three-electrode types, these dislodged electrons usually do not cause trouble because no positive electrode other than the plate itself is present to by electrons from the cathode is called secondary emission because the effect is are drawn back to the plate. Emission caused by bombardment of an electrode secondary to the original cathode emisattract them. These electrons, therefore,

proximity of the positive screen grid to In the case of screen-grid tubes, the the plate offers a strong attraction to larly so if the plate voltage swings lower lowers the plate current and limits the these secondary electrons and particuthan the screen-grid voltage. This effect useful plate-voltage swing for tetrodes.

are minimized when a fifth electrode is The effects of secondary emission placed within the tube between the screen grid and plate. This fifth electrode is known as the suppressor grid (grid

No.3) and is usually connected to the its negative potential with respect to the plate, the suppressor grid retards the flight of secondary electrons and diverts cathode, as shown in Fig. 8. Because of them back to the plate.



The family name for a five-electrode tube is "pentode". In power-output pentodes, the suppressor grid makes possible higher power output with lower makes possible high voltage amplifica-These desirable features result from the grid-driving voltage; in radio-frequency amplifier pentodes the suppressor grid fact that the plate-voltage swing can be age may be as low as, or lower than, the in signal-gain capability. Representative tion at moderate values of plate voltage. made very large. In fact, the plate voltscreen-grid voltage without serious loss pentodes used for power amplification are the 3V4 and 6K6GT; representative pentodes used for voltage amplification are the 1U4, 6AU6A, 6BA6, and 5879.

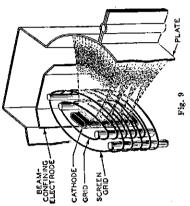
Beam Power Tubes

are used to increase substantially the A beam power tube is a tetrode or pentode in which directed electron beams tual suppressor grid, the electrodes are power-handling capability of the tube. Such a tube contains a cathode, a conirol grid (grid No.1), a screen grid (grid No.2), a plate, and, optionally, a suppressor grid (grid No.3). When a beam bower tube is designed without an acso spaced that secondary emission from the plate is suppressed by space-charge effects between screen grid and plate. The space charge is produced by the slowing up of electrons traveling from a high-potential screen grid to a lowerpotential plate. In this low-velocity region, the space charge produced is suffi-

cient to repel secondary electrons emitted from the plate and to cause them to return to the plate.

grid is shaded from the cathode by a grid and control grid causes the electrons the screen grid so that very few of them strike the screen grid. Because of the effective suppressor action provided by space charge and because of the low current drawn by the screen grid, the beam power tube has the advantages of high power output, high power sensitivity, is its low screen-grid current. The screen grid and the control grid are spiral wires wound so that each turn of the screen grid turn. This alignment of the screen to travel in sheets between the turns of turning to the screen grid outside of the beam. A feature of a beam power tube Beam power tubes of this design employ beam-confining electrodes at cathode potential to assist in producing the desired beam effects and to prevent stray electrons from the plate from reand high efficiency.

Fig. 9 shows the structure of a beam pression and illustrates how the electrons power tube employing space-charge sup-



the beam-confining electrodes coincide gion is extended beyond the beam boundaries and stray secondary electrons are prevented from returning to the with the dashed portion of the beam. In this way the space-charge potential region is indicated by the heavily dashed ines in the beam. Note that the edges of are confined to beams. The beam conditential less than the screen-grid potention illustrated is that for a plate potial. The high-density space-charge re-

screen grid outside of the beam. The space-charge effect may also be obtained. by use of an actual suppressor grid. Examples of beam power tubes are 6AQ5A, = Electrons, Electrodes, and Electron Tubes = SLGGB, 6V6GT, and 50C5.

Multi-Electrode and **Multi-Unit Tubes**

signed for general service; that is, a single tube type—a triode—was used as frequency amplifier, an oscillator, or a of application, one tube did not meet all ment and application, tubes were dea radio-frequency amplifier, an interdetector. Obviously, with this diversity Early in the history of tube developrequirements to the best advantage. mediate-frequency amplifier,

requencies at the same time. The tube rent in the tube is varied at two different oined sync separator and sync clipper in classed as multi-electrode types. The 6BY6 is an especially interesting type in is designed primarily for use as a comar application or to combine in one bulb functions which formerly required two or more tubes. The first class of tubes includes such examples of specialty types as the 6CB6 and 6BY6. Types of this class generally require more than three electrodes to obtain the desired special characteristics and may be broadly this class. This tube has an unusually large number of electrodes, namely seven, exclusive of the heater. Plate curtypes. These types are intended either to sign are the development of "specialty" give optimum performance in a particu-Later and present trends of tube detelevision receivers.

todes such as the 6U8A and 6X8. This vertical oscillators and vertical deflec-Full-wave rectifiers are also multi-unit unit tubes such as the twin-diode triodes such as the 6CG7 and 12AX7, and types such as the 6CM7 containing dissimilar triode units used primarily as combined The second class includes multi-6BF6 and 6AV6, as well as triode-penclass also includes class A twin triodes tion amplifiers in television receivers.

6SA7. These tubes are similar to the grid-converter types 1R5, 6BE6, and A third class of tubes combines features of each of the other two classes. Typical of this third class are the pentatypes.

Receiving Tube Structure

Receiving tubes generally utilize a 6AC7 and the 6AG7. Many modern types glass or metal envelope and a base. Originally, the base was made of metal or Types having a metal envelope and molded phenolic octal base include the conventional tube designs utilizing glass noval types, and the twelve-pinduodecar molded phenolic material. Types having a glass envelope and a molded phenolic base include the "octal" types such utilize integral glass bases. Present-day Examples of the nine-pin miniature types as the 5U4GB and the 6SN7GTB, envelopes and integral glass bases include the seven-pin and nine-pin minitypes. Examples of the seven-pin mini-The nine-pin base for the novar types ature types, the nine-pin novar and neoature types are the 6AU6A and 6BN6. are the 12AU7A and 6EA8. Examples of has a relatively large pin-circle diameter the novar types are the 6BH3 and 7868. and long pins to insure firm retention of the tube in its socket.

The nuvistor concept provided a new approach to electron tube design.

tilever-supported cylindrical electrode These tubes combine new materials, proc-Nuvistor tubes utilize a light-weight canstructure housed in a ceramic-metal envelope (see page 2 for cutaway view). esses, and fabrication techniques. Examples of the nuvistor are the 2CW4 and the 6CW4.

Television Picture Tubes

The picture tube, or kinescope, is a multi-electrode tube used principally in television receivers for picture display. It consists essentially of an electron gun, a glass or metal-and-glass envelope and face-plate combination, and a fluorescent screen.

and ion-trap-magnet arrangement.

The electron gun includes a cathode for the production of free electrons, one or more control electrodes for acceleroptionally, a device for "trapping" unating the electrons in the beam, and, wanted ions out of the electron beam.

means of a focusing coil placed on the neck of the tube, or electrostatically, as shown in Fig. 10, by means of a focusing Focusing of the beam is accomplished either electromagnetically by electrode (grid No. 4) within the envefluorescing phosphor P4 of either the lope of the tube. The screen is a whitesilicate or the sulfide type.

plished either electrostatically by means Deflection of the beam is accomof deflecting electrodes within the envelope of the tube, or electromagnetically

degrees with respect to each other. The in opposition to the lateral shift of the axis of the envelope, and are spaced 120 ocusing electrodes of the three guns are to converge at the screen while they are The three electron guns are mounted tential is adjusted to cause the separate beams to focus at the phosphor-dot screen. All three beams must be made simultaneously being deflected, Convergence is accomplished by the action assembly mounted on the neck of the radial-converging pole pieces within the tube. Another pair of pole pieces in the ng magnet also mounted on the neck of the tube. These pole pieces permit ateral shift in position of the blue beam with their axes tilted toward the central interconnected internally, and their poof static and dynamic magnetic fields set up by the radial-converging magnet tube. These fields are coupled into the tube is activated by the lateral-converggreen and red beams. the neck of the tube. Fig. 10 shows the structure of the gun section of a picture tube and illustrates how the elecan aluminum film on the gun side of the wanted ions, but also improves picture nized tubes, ions are separated from the electron beam by means of a tilted-gun Color television picture tubes are but differ in three major ways. (1) The light-emitting screen is made up of trios ble of emitting light in one of the three by means of a deflecting yoke placed on tron beam is formed and how the beam netic deflecting yoke. In this type of tube, ions in the beam are prevented from damaging the fluorescent screen by screen. This film not only "traps" uncontrast. In many types of non-alumiof phosphor dots deposited in an interaced pattern. Each dot of a trio is capais deflected by means of an electromagsimilar to black-and-white picture tubes, primary colors (red, green, or blue). (2)

is used to minimize the effects of the tire area of the screen. A magnetic shield A purifying magnet is used with color picture tubes to provide a magdirection, to effect register over the ennetic field, adjustable in magnitude and earth's magnetic field.

Deflection of the three beams is acing yoke consisting of four electromagnetic coils similar to the deflecting yoke used for black-and-white picture tubes. complished simultaneously by a deflect-

phor-dot arrays. Thus it is possible to

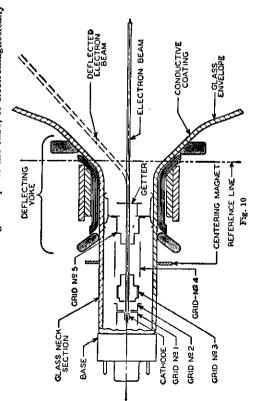
control the brightness of each of the three colors independently of the other two.

closely spaced electron guns, built as a tion of the three different color-phos-

phosphor dots of each trio.

A shadow mask mounted near the screen of the tube contains over 300,000 apertures, one for each of the phosphor dot trios. This mask provides color separation by shadowing two of the three unit, provide separate beams for excita-

(3) Three



Π

Characteristics Electron Tube

The term "characteristics" is used to identify the distinguishing electrical These values may be shown in curve and the calculation of additional tube features and values of an electron tube. form or they may be tabulated. When the characteristics values are given in the determination of tube performance curve form, the curves may be used for factors.

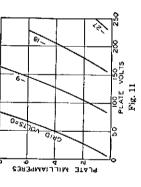
Tube characteristics are obtained from electrical measurements of a tube in various circuits under certain definite conditions of voltages. Characteristics may be further described by denoting ues obtained with different de potentials the conditions of measurements. For example Static Characteristics are the valapplied to the tube electrodes, while Dytained with an ac voltage on a control grid under various conditions of dc potentials on the electrodes. The dynamic characteristics, therefore, are indicative of the performance capabilities of a tube namic Characteristics are the values obunder actual working conditions.

Static characteristics may be shown fer (mutual) characteristics curves. These usefulness. The plate characteristic curve is obtained by varying plate volttransfer-characteristic family of curves by plate characteristics curves and transcurves present the same information. but in two different forms to increase its age and measuring plate current for different grid bias voltages, while the transfer-characteristic curve is obtained by varying grid bias voltage and measuring plate current for different plate voltages. A plate-characteristic family of curves is illustrated by Fig. 11. Fig. 12 gives the for the same tube.

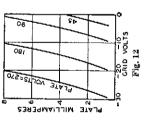
Dynamic characteristics include amplification factor, plate resistance, control-grid-plate transconductance, and certain detector characteristics, and may be shown in curve form for variations in tube operating conditions.

The amplification factor, or μ , is the ratio of the change in plate voltage

changed and that all other electrode to a change in control-electrode voltage in the opposite direction, under the condition that the plate current remains unvoltages are maintained constant. For example, if, when the plate voltage is



electrode (grid-No.1) voltage must be made 0.1 volt more negative to hold other words, a small voltage variation in the grid circuit of a tube has the same made 1 volt more positive, the controlplate current unchanged, the amplification factor is 1 divided by 0.1, or 10. In 23 effect on the plate current



to the product of the grid-voltage change and amplification factor. The μ of a tube plate-voltage change—the latter equal is often useful for calculating stage gain. This use is discussed in the ELECTRON TUBE APPLICATIONS SECTION.

tube is the resistance of the path between cathode and plate to the flow of alternating current. It is the quotient of a Plate resistance (rp) of an electron

is 2000 micromhos. small change in plate voltage divided by

milliampere (0.0001 ampere) is produced by a plate voltage variation of 1 volt,

of resistance. Thus, if a change of 0.1

the corresponding change in plate cur-

= Electron Tube Characteristics =

approach zero. When the performance (rf) voltage producing it; or more precisely, it is the limiting value of this the same way as control-grid—plate Conversion transconductance (gc) is a characteristic associated with the the intermediate-frequency (if) current in the primary of the if transformer diquotient as the rf voltage and if current conversion transconductance is used in transconductance is used in single-fremixer (first detector) function of tubes and may be defined as the quotient of vided by the applied radio-frequency of a frequency converter is determined, quency amplifier computations. ance. Transconductance may be more the amplification factor and the plate resistance, and is the quotient of the rent and is expressed in ohms, the unit the plate resistance is 1 divided by Control-grid-plate transconductis a factor which combines in one term first divided by the second. This term has also been known as mutual conductchange in plate current (amperes) di-

ance, or simply transconductance (gm),

0.0001, or 10000 ohms.

plifier tube is the ratio of the ac power age de plate voltage (E_b) and de plate output (P_o) to the product of the aver-The plate efficiency of a power amcurrent (Ib) at full signal, or

changed. Thus, if a grid-voltage change

dition that all other voltages remain un-

of 0.5 volt causes a plate-current change of 1 milliampere (0.001 ampere), with all other voltages constant, the trans-0.002 mho. A "mho" is the unit of conductance and was named by spelling millionth of a mho, or a micromho

vided by the small change in the controlgrid voltage producing it, under the con-

strictly defined as the quotient of a small

conductance is 0.001 divided by 0.5, or

ohm backwards. For convenience, a

The power sensitivity of a tube is square of the input signal voltage (Em) the ratio of the power output to the and is expressed in mhos as follows:

Power sensitivity (mhos) = $\frac{Po \text{ watts}}{(Ein, rms)^2}$

ance. Thus, in the example, 0.002 mho

umho), is used to express transconduct-

Electron Tube Applications

The diversified applications of an electron receiving tube have, within the scope of this section, been treated under seven headings. These are: Amplification, Rectification, Detection, Automatic Volume or Gain Control, Oscillation, Frequency Conversion, and Automatic Frequency Control. Although these operations may take place at either radio or audio frequencies and may involve the use of different circuits and different supplemental parts, the general considerations of each kind of operation are basic.

Amplification

This action can be utilized in electronic The amplifying action of an electron tube was mentioned under Triodes in the section on ELECTRONS, ELECamplifier service recognized by engineers TRODES, and ELECTRON TUBES. circuits in a number of ways, depending upon the results desired. Four classes of are covered by definitions standardized by the Institute of Radio Engineers, This classification depends primarily on the fraction of input cycle during which plate current is expected to flow under rated full-load conditions. The classes are class A, class AB, class B, and class C. The term "cutoff bias" used in these definitions is the value of grid bias at which plate current is very small.

Classes of Service

A class A amplifier is an amplifier in which the grid bias and alternating grid voltages are such that plate current in a specific tube flows at all times.

A class AB amplifier is an amplifier in which the grid bias and alternating grid voltages are such that plate current in a specific tube flows for appreciably more than half but less than the entire electrical cycle.

A class B amplifier is an amplifier in which the grid bias is approximately equal to the cutoff value, so that the plate current is approximately zero when no exciting grid voltage is applied,

and so that plate current in a specific tube flows for approximately one-half of each cycle when an alternating grid voltage is applied.

A class C amplifier is an amplifier in which the grid bias is appreciably greater than the cutoff value, so that the plate current in each tube is zero when no alternating grid voltage is applied, and so that plate current flows in a specific tube for appreciably less than one-half of each cycle when an alternating grid voltage is applied.

The suffix I may be added to the letter or letters of the class identification to denote that grid current does not flow during any part of the input cycle. The suffix 2 may be used to denote that grid current flows during part of the cycle.

For radio-frequency (rf) amplifiers which operate into a selective tuned circuit, as in radio transmitter applications, or under requirements where distortion is not an important factor, any of the stage. For audio-frequency (af) amplifiers in which distortion is an important factor, only class A amplifiers permit single-tube operation. In this case, operating conditions are usually chosen so that distortion is kept below the conventional 5 per cent for triodes and the conventional 7 to 10 per cent for tetrodes or amplifiers, reduced distortion with imamplifiers, a balanced stage using two above classes of amplifiers may be used, either with a single tube or a push-pull pentodes. Distortion can be reduced below these figures by means of special circuit arrangements such as that discussed tained by using a push-pull stage for audio service. With class AB and class B under inverse feedback. With class A proved power performance can be obtubes is required for audio service.

Class A Voltage Amplifiers

As a class A voltage amplifier, an electron tube is used to reproduce grid-voltage variations across an impedance or a resistance in the plate circuit. These

variations are essentially of the same form as the input signal voltage impressed on the grid, but their amplitude is increased. This increase is accomplished by operation of the tube at a suitable grid hias so that the applied grid input voltage produces plate-current variations proportional to the signal swings. Because the voltage variation obtained in the plate circuit is much larger than that required to swing the grid, amplification of the signal is ob-

tained. Fig. 13 gives a graphical illustration of this method of amplification and



Fig. 13

shows, by means of the grid-voltage vs. plate-current characteristics curve, the effect of an input signal (S) applied to the grid of a tube. The output signal (O) is the resulting amplified plate-current

variation.

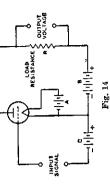
The plate current flowing through the load resistance (R) of Fig. 14 causes a voltage drop which varies directly with the plate current. The ratio of this voltage variation produced in the load resistance to the input signal voltage is the voltage amplification, or gain, provided by the tube. The voltage amplification due to the tube is expressed by the following convenient formulas:

Voltage amplification $= \frac{\mu \times R_L}{R_L + r_p}$



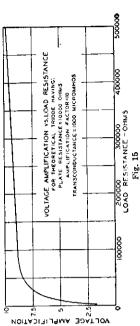
where μ is the amplification factor of the tube, R_L is the load resistance in ohms, r_D is the plate resistance in ohms, and g_m is the transconductance in micromhos.

From the first formula, it can be seen that the gain actually obtainable



from the tube is less than the tube amplification factor but that the gain approaches the amplification factor when the load resistance is large compared to the tube plate resistance. Fig. 15 shows graphically how the gain approaches the amplification factor of the tube as the load resistance is increased. From the curve it can be seen that a high value of load resistance should be used to obtain high gain in a voltage amplifier.

the load resistance-coupled amplifier, the load resistance of the tube is approximately equal to the resistance of the plate resistor in parallel with the grid resistor of the following stage. Hence, to obtain a large value of load resistorance, it is necessary to use a plate resistor and a grid resistor of large resistance. However, the plate resistor should not be too large because the flow of plate current through the plate resistor produces a voltage drop which reduces the plate voltage applied to the tube. If the plate resistor is too large, this drop will be too



13

A higher value of grid resistance is permissible when cathode-resistor bias When cathoderesistor bias is used, a effects is almost completely offset by an ncrease in bias due to the voltage drop loss in bias due to gas or grid-emission tube types used in resistance-coupled used than when fixed bias is used. across the cathode resistor. Typical valaes of plate resistor and grid resistor for circuits, and the values of gain obtainable, are shown in the RESISTANCE-COUPLED AMPLIFIER SECTION

The input impedance of an electron nductance which is common to both the tube (that is, the impedance between rive component due to the capacitance between grid and cathode, (2) a resistive put impedance is very high at audio grid and cathode) consists of (1) a reaccomponent resulting from the time of transit of electrons between cathode and veloped by the part of the cathode lead input and output circuits. Components (2) and (3) are dependent on the frefrequencies when a tube is operated with its grid biased negative. In a class A₁ or AB transformer-coupled audio amplifier, therefore, the loading imposed by grid, and (3) a resistive component dequency of the incoming signal. The in-

input impedance of the tube; however, transformer design considerations may limit the choice.

At the higher radio frequencies, the drops very rapidly as the frequency is frequencies to affect appreciably the input impedance may become very low even when the grid is negative, due to the finite time of passage of electrons between cathode and grid and to the appreciable lead reactance. This impedance raised, and increases input-circuit loading. In fact, the input impedance may become low enough at very high radio Tubes such as the "acorn" and "pencil" types and the high-frequency miniatures have been developed to have low input capacitances, low electron-transit time, and low lead inductance so that their input impedance is high even at the nau admittance is the reciprocal of input gain and selectivity of a preceding stage. frequencies, radio impedance. ultra-high

> in turn, will cause further decrease in bias. The action is cumulative and results in a runaway condition which can

destroy the tube.

lation is the effect produced in a radio of the station to which the receiver is pears as audio-frequency distortion in the output. This effect is produced by A remote-cutoff amplifier tube is a modified construction of a pentode or a tetrode type designed to reduce moduation-distortion and cross-modulation in radio-frequency stages, Cross-moduor television receiver by an interfering station "riding through" on the carrier tuned. Modulation-distortion is a distortion of the modulated carrier and apa radio-frequency amplifier stage operating on an excessively curved characteristic when the grid bias has been increased to reduce volume. The offending stage for cross-modulation is usually the first radio-frequency amplifier, while for modulation-distortion the cause is usually The characteristics of remote-cutoff types are such as to enable them to handle both large and small input signals with minimum distortion over a the last intermediate-frequency stage. wide range of signal strength.

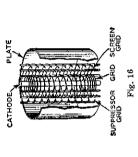
Fig. 16 illustrates the construction of the grid No.1 (control grid) in a remote-cutoff tube. The remote-cutoff action is due to the structure of the grid which provides a variation in amplification factor with change in grid bias. The grid No.1 is wound with open spacing at

the grid on the input transformer is

negligible. As a result, the secondary put transformer can be made very high

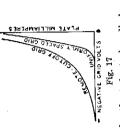
mpedance of a class A₁ or class AB₁ inbecause the choice is not limited by the

more negative to handle larger input form spacing. As the grid bias is made the non-uniform turn spacing of the grid on cathode emission and tube characteristics is essent ally the same as for unibias are applied to the tube, the effect of the middle and with close spacing at the ends. When weak signals and low grid



tions of the cathode enclosed by the ends the open section of the grid. This action changes the gain of the tube so that large signals may be handled with minisignals, the electron flow from the secof the grid is cut off. The plate current and other tube characteristics are then dependent on the electron flow through mum distortion due to cross-modulation and modulation-distortion.

similar at small grid-bias voltages, the plate current of the remote-cutoff tube dias voltage. This slow change makes it drops quite slowly with large values of cutoff type compared with the curve for It will be noted that while the curves are Fig. 17 shows a typical plate-current vs. grid-voltage curve for a remotea type having a uniformly spaced grid.

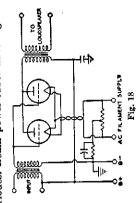


nalssatisfactorily. Becauseremote-cutoff signals, they are particularly suitable for use in sets having automatic volume control. Remote-cutoff tubes also are possible for the tube to handle large sigtypes can accommodate large and small known as variable-mu types.

Class A Power Amplifiers

of a radio or television receiver to supply a relatively large amount of power to tance than high voltage amplification; therefore, gain possibilities are sacrificed in the design of power tubes to obtain power-handling capability. As a class A power amplifier, an the loudspeaker. For this application, large power output is of more imporelectron tube is used in the output stage

triodes. Beam power tubes have higher by low power sensitivity, low plate-Power tubes of the pentode type are Triodes, pentodes, and beam power tubes designed for power amplifier service have certain inherent features for each structure. Power tubes of the triode type for class A service are characterized power efficiency, and low distortion. characterized by high power sensitivity, high plate-power efficiency and, usually, somewhat higher distortion than class A



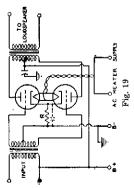
power sensitivity and efficiency than triode or conventional pentode types.

A class A power amplifier is also used as a driver to supply power to a advisable to use a triode, rather than a pentode, in a driver stage because of the class AB, or a class B stage. It is usually ower plate impedance of the triode.

tive transconductance of the stage is provides twice the output of a single doubled, and the effective plate resistance and the load resistance required are halved as compared with single-Power tubes connected in either parallel or push-pull may be employed as class A amplifiers to obtain increased output. The parallel connection (Fig. 18) tube with the same value of grid-signal voltage. With this connection, the effecube values.

although it requires twice the grid-signal The push-pull connection (Fig. 19),

voltage, provides increased power and single-tube operation. Distortion caused by even-order harmonics and hum caused has other important advantages over



approaching the load resistance for a single-tube operation, appreciably more load resistance for the stage to a value by plate-voltage-supply fluctuations are tained with triodes by decreasing the either eliminated or decidedly reduced through cancellation. Because distortion for push-pull operation is less than for than twice single-tube output can be ob-

for single-tube operation. If a cathode tion, they can often be eliminated by the proximately 100 ohms connected in class A operation of two tubes, all electrode currents are doubled while all de electrode voltages remain the same as resistor is used, its value should be about one-half that for a single tube. If oscillaseries with each grid at the socket For either parallel or push-pull tions occur with either type of connecuse of a non-inductive resistor of apsingle tube.

Operation of power tubes so that terminal.

Power-Output Calculations

having low de resistance can be made without serious error from the plate per-cent second-harmonic distortion can also be determined. The calculations are made graphically and are illustrated in Calculation of the power output of either an output transformer or a choke grid bias, optimum load resistance, and amily of curves by assuming a resistance load. The proper plate current, Fig. 20 for given conditions. The proa triode used as a class A amplifier with cedure is as follows:

mately one-half the filament voltage

rating of the tube.

rent Io should be used to determine the influencing tube life. In a class A ampliplate dissipation is equal to the power

The value of zero-signal plate cur-

plate dissipation, an important factor

operated filament. When the filament is

of filament types of tubes, the calculations are given on the basis of a dcac-operated, the calculated value of dc cias should be increased by approxifier under zero-signal conditions, the

input, i.e., the product of the dc plate voltage Eo and the zero-signal dc plate

with the zero-signal bias Eco calculated above, it will be necessary to increase the bias by a sufficient amount so that the actual plate dissipation does not exceed the rating before proceeding further For power-output calculations, it is assumed that the peak alternating grid voltage is sufficient (1) to swing the grid from the zero-signal bias value Ec. to zero bias ($\mathbb{E}_c = 0$) on the positive swing and (2) to swing the grid to a value twice the zero-signal bias value on the swing, the plate voltage and plate current reach values of Emax and Imin; durof Emin and Imax. Because power is the

with the remaining calculations.

dissipation rating of the tube is exceeded

current Io. If it is found that the plate-

P by determining the zero-signal bias (1) Locate the zero-signal bias point Eco from the formula:

Zero-signal bias (Eco) = $-(0.68 \times Eb)/\mu$

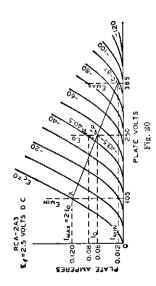
de plate voltage at which the tube is to factor of the tube. This quantity is where E_b is the chosen value in volts of be operated, and μ is the amplification shown as negative to indicate that a negative bias is used.

(2) Locate the value of zero-signal plate current, Io, corresponding to point (3) Locate the point 2I., which is twice the value of Io and corresponds to the value of the maximum-signal plate current Inax.

(4) Locate the point X on the dc bias curve at zero volts, E_c = 0, corresponding to the value of I_{max} . (5) Draw a straight line XY through

X and P.

sistance line. Its slope corresponds to Line XY is known as the load re-



the grids run positive is inadvisable except under conditions such as those discussed in this section for class AB and class B amplifiers.

the value of the load resistance. The load resistance in ohms is equal to (E_{max}-E_{mt}.) divided by (I_{max}-I_{min}), where E is in volts and I is in amperes.

It should be noted that in the case

as shown in Fig. 20. The tube is to be-Example: Determine the load resistance, power output, and distortion of a triode having an amplification factor of 4.2, a plate-dissipation rating of 15 watts, and plate characteristics curves operated at 250 volts on the plate. the calculations repeated.

and, therefore, the plate-dissipation ratthe zero-signal plate current to 0.06 amply; if the filament is to be operated on or to -45 volts, and the circuit returns. plate voltage of 250 volts is 0.08 ampere Consequently, it is necessary to reduce seen to be -43.5 volts. Note that the curve was taken with a de filament supmade to the mid-point of the filament: Procedure: For a first approximation, determine the operating point P. that the zero-signal plate current ${f I}_{
m o}$ at a pere at 250 volts. The grid bias is now an ac supply, the bias must be increased $-(0.68 \times 250) / 4.2 = -40.5 \text{ volts. From}$ the curve for this voltage, it is found ing is exceeded $(0.08 \times 250 = 20 \text{ watts})$. by about one-half the filament voltage, from the zero-signal bias formula, $Ec_0 =$

Point X is at the intersection of the dcbias curve at zero volts with $I_{\rm max}$, where from the curves. Substituting these values in the power-output formula, we $I_{max} = 2I_o = 2 \times 0.06 = 0.12$ ampere. Line XY is drawn through points P and X. Emar, Emin, and Imp are then found Point X can now be determined. circuit. obtain

negative swing. During the negative

ing the positive swing, they reach values

product of voltage and current, the power output Po as shown by a watt-

Po = (0.12-0.012) × (365-105) 3.52 watts

The resistance represented by loads ine XY is

$$\frac{(365 - 105)}{(0.12 - 0.012)}$$
 = 2410 ohms

When the values from the curves: are substituted in the distortion formula.. we obtain

triodes, some distortion is present. This

distortion is due predominantly to second harmonics in single-tube amplifiers. tortion may be calculated by the follow-

The percentage of second-harmonic dis-

In the output of power amplifier

where E is in volts, I is in amperes, and

Po is in watts.

Po = (Imax - Imin) X (Emax - Emin)

meter is given by

ever, the distortion is excessive and it is: It is customary to select the load: monic distortion generally does not exresistance so that the distortion does not shown is used to determine the slope of the load resistance line, the second-harceed five per cent. In the example, how desirable, therefore, to use a slightly exceed five per cent. When the method

where Io is the zero-signal plate current

% distortion • Imax - Imin

 $Imax + Imin - I_0$

ing formula:

in amperes. If the distortion is excessive, the load resistance should be increased or, occasionally, decreased slightly and

Operating conditions for triodes in to produce plate-current cutoff at a plate voltage of 1.4Eo where Eo is the tion desired. Under class A conditions, are all relatively low. The operating bias can be anywhere between that specified to one-half the grid-bias voltage required operating plate voltage. Higher bias than push-pull depend on the type of operadistortion, power output, and efficiency for single-tube operation and that equal this value requires higher grid-signal voltage and results in class AB, operation which is discussed later.

21), intersecting the $E_c=0$ curve at the pull class A operation is as follows: The method for calculating maximum power output for triodes in push-Erect a vertical line at $0.6~\mathrm{E}_{
m o}$ (see Fig.

watts. Then, for class A operation, the plate dissipation rating of the tube is 15 operating bias can be equal to, but not more than, one-half the grid bias for cutvolts. (Since cutoff bias is approximately -115 volts at a plate voltage of 420 volts, At this bias, the plate current is found from the plate family to be 0.054 ampere and, therefore, the plate dissipation is 0.054×300 or 16.2 watts. Since -57.5 volts is the limit of bias for class A operation of these tubes at a plate voltage of 300 volts, the dissipation cannot be reduced by increasing the bias and it, therefore, becomes necessary to reduce off with a plate voltage of 1.4 imes 300 = 420one-half of this value is -57.5 volts bias.) the plate voltage.

If the plate voltage is reduced to rent is 0.06 ampere, and the plate dissipation is 15 watts. Then, following the 250 volts, the bias will be found to be -43.5 volts. For this value, the plate cur-

250 300 PLATE VOLTS RCA-2A3 \$3839MA 318J9 0.2

point Imax. Then, Imax is determined from the curve for use in the formula

 $P_0 = (Imax \times E_0)/6$

If I_{max} is expressed in amperes and E_o in volts, power output is in watts.

push-pull is as follows: Draw a load line through the E_o point on the zero-current plate load (Rpp) for two triodes in a The method for determining the through I_{max} on the zero-bias curve and class A push-pull amplifier. Expressed proper load resistance for triodes in axis. Four times the resistance represented by this load line is the plate-toas a formula.

0.2 = 2000 ohms.

 $R_{pp} = 4 \times (E_0 - 0.6E_0)/Imax$

where Eo is expressed in volts, Imax in amperes, and Rpp in ohms.

voltage (E_o) is to be 300 volts, and the Example: Assume that the plate

the change in bias from O₁ to A₁. If this

The intersection of the line with the curve $E_c = 0$ is I_{max} or 0.2 ampere. When $\sqrt{5} = 10$ watts. The load resistance is demethod for calculating power output, erect a vertical line at $0.6E_o = 150$ volts. this value is substituted in the power formula, the power output is (0.2×250) termined from the load formula: Plateto-plate load $(R_{pp}) = 4 \times (250 - 150)$ Power output for a pentode or a beam power tube as a class A amplifier can be calculated in much the same way as for triodes. The calculations can be made graphically from a special plate family of curves, as illustrated in Fig. 22.

From a point A at or just below the trarily selected load lines to intersect the knee of the zero-bias curve, draw arbishould be on both sides of the operating zero-plate-current axis.

= Electron Tube Applications

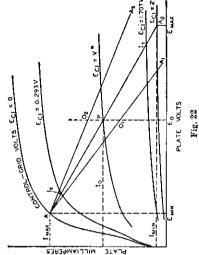
% total (2nd and 3rd) harmonic distortion = ✓(%2nd)² + (%3rd)²

Conversion Factors

and one-half the maximum-signal plate

point P whose position is determined by the desired operating plate voltage, Eo, current. Along any load line, say AA1, measure the distance AO₁. On the same ine, lay off an equal distance, O.A.. For optimum operation, the change in bias from A to O. should be nearly equal to condition can not be met with one line,

values other than those shown in the published data can be obtained by the Operating conditions for voltage use of the nomograph shown in Fig. 23 when all electrode voltages are changed simultaneously in the same ratio. The



as is the case for the line first chosen, then another should be chosen. When the most satisfactory line has been selected, its resistance may be determined by the following formula:

Load resistance (RL) =
$$\frac{\text{Emax} - \text{EmIn}}{\text{Imax} - \text{ImIn}}$$

stituted in the following formula for The value of RL may then be subcalculating power output.

$$P_0 = \frac{[{\rm Imax-Imin} + 1.41 \; ({\rm Ix-Iy})]^2 R_L}{32}$$

amperes, E is in volts, R_L is in ohms, and P_0 is in watts. I_x and I_y are the cur-In both of these formulas, I is in ages of $E_{c_1} = V - 0.707V = 0.293V$ and rent values on the load line at bias volt- $\text{Ec}_{\text{i}} = \text{V} + 0.707 \text{V} = 1.707 \text{V}$, respectively.

las. The terms used have already been Calculations for distortion may be made by means of the following formudefined.

 $\frac{1}{1000} \times \frac{1}{100} \times \frac{1$ % 2nd-harmonic distortion = Imax + Imh - 2 Io

 $\frac{I_{max} - I_{min} - 1.41 \; (I_x - I_y)}{I_{max} - I_{min} + 1.41 \; (I_x - I_y)} \times 100$ % 3rd-harmonic distortion =

and transconductance (Fgm) for voltage are expressed as functions of the ratio The relations shown are applicable to ratios between 0.5 and 2.0. These factors any electrode (E_{des}) and the published or original value of that voltage (Epub). triodes and multigrid tubes in all classes nomograph includes conversion factors for current (F₁), power output (F_p), plate resistance or load resistance (Fr), between the desired or new voltage for

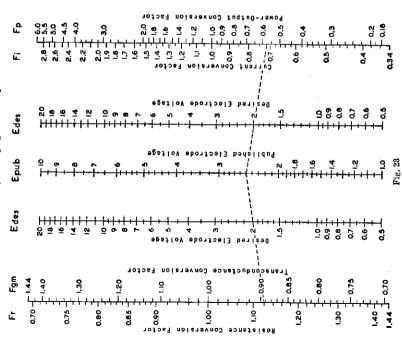
a straight-edge across the page so that To use the nomograph, simply place it intersects the scales for Edes and Epub at the desired values. The desired conversion factor may then be read directly or estimated at the point where the straight-edge intersects the F1, Fp Fr, or of service.

ating conditions for this class of service are for a plate voltage of 250 volts. The operating conditions for the new plate For example, suppose it is desired to operate two 6L6GB's in class A.pushpull, fixed bias, with a plate voltage of 200 volts. The nearest published oper-Fgm scale.

The voltage conversion factor, Fe, voltage can be determined as follows:

lines on the nomograph of Fig. 23 indiis equal to 200/250 or 0.8. The dashed proximately 0.72, Fp is approximately cate that for this voltage ratio F_i is ap-

Because contact-potential effects become noticeable only at very small de grid-No.1 (bias) voltages, they are generally negligible in power tubes. Secondary



is 1.12, and Fgm is approxiplied directly to operating values shown n the tube data, or to values calculated mately 0.892. These factors may be apby the methods described previously.

when the value of the ratio Edes / Epun is Secause this method for conversion graph decreases progressively as the of characteristics is necessarily an apratio Edes/Epub departs from unity. In general, results are substantially correct between 0.7 and 1.5. Beyond these limts, the accuracy decreases rapidly, and the results obtained must be considered proximation, the accuracy of the norro-

The nomograph does not take into consideration the effects of contact potential or secondary emission in tubes. rough approximations,

emission may occur in conventional tetrodes, however, if the plate voltage swings below the grid-No.2 voltage. Consequently, the conversion factors shown in the nomograph apply to such tubes only when the plate voltage is greater than the grid-No.2 voltage. Because secondary emission may also occur in certain beam power tubes at very low values of plate current and plate voltage, the conversion factors shown in the nomograph do not apply when these tubes are operated under such conditions.

Class AB Power Amplifiers

A class AB power amplifier employs two tubes connected in push-pull with a higher negative grid bias than is

Electron Tube Applications ==

than for class A amplifiers because the dissipation rating. As a result of these higher voltages, more power output can used in a class A stage. With this higher negative bias, the plate and screen-grid voltages can usually be made higher increased negative bias holds plate curcent within the limit of the tube platebe obtained from class AB operation.

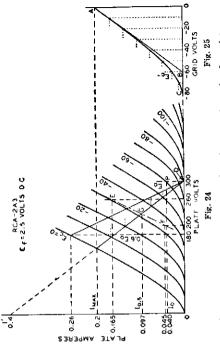
into class AB, and class AB2. In class grid is not greater than the negative grid-bias voltage. The grids therefore and do not draw current. In class AB,, the peak signal voltage is greater than the bias so that the grids are driven Class AB amplifiers are subdivided AB, there is no flow of grid current. That is, the peak signal voltage applied to each are not driven to a positive potential positive and draw current.

Because of the flow of grid current in a class AB2 stage there is a loss of

power supply, with the result that power drop rectifier, such as the 5V4GA, with a fluctuations in the voltage output of the output is decreased and distortion is intion it is usually advisable to use a lowance of the filter choke and power transcreased. To obtain satisfactory regulachoke-input filter. In all cases, the resistformers should be as low as possible.

Class AB, Power Amplifiers

In this service, the dynamic load line Fig. 24. Its position is not affected by the operating grid bias provided the In class AB, push-pull amplifier does not pass through the operating point P as in the case of the single-tube amplifier, but through the point D in service using triodes, the operating conditions may be determined graphically by means of the plate family if E_o , the desired operating plate voltage, is given.



bower in the grid circuit. The sum of this loss and the loss in the input transformer is the total driving power required by the grid circuit. The driver stage should be capable of a power outquired power in order that distortion introduced in the grid circuit be kept ow. The input transformer used in a out considerably larger than this reclass AB, amplifier usually has a stepdown turns ratio.

Because of the large fluctuations of plate current in a class AB, stage, it is should have good regulation. Otherwise the fluctuations in plate current cause important that the plate power supply

plate-to-plate load resistance remains constant.

signal plate current and, from it, the zero-signal plate dissipation. Because age, a higher signal voltage may be used Under these conditions, grid bias output. Grid bias cannot be neglected, however, since it is used to find the zerothe grid bias is higher in class AB, than in class A service for the same plate voltwithout grid current being drawn and, therefore, higher power output is obhas no appreciable effect on the power

In general, for any load line through point D, Fig. 24, the plate-to-plate load tained than in class A service.

0.636 Imax × Eo.

It is desirable to simplify these formulas for a first approximation. This simplification can be made if it is assumed that the peak plate current, Imax occurs at the point of the zero-bias curve corresponding approximately to 0.6 Eo, the condition for maximum power output. The simplified formulas are:

 $P_0 \; (\text{lor two tubeg}) = \; (I_{max} \; X \; E_0)/6 \\ R_{pp} = \; 1.6 E_0/I_{max}$

where E_o is in volts, I_{max} is in amperes, R_{pp} is in ohms, and P_o is in watts.

It may be found during subsequent calculations that the distortion or the plate dissipation is excessive for this approximation; in that case, a different load resistance must be selected using the first approximation as a guide and the process repeated to obtain satisfactory operating conditions.

Example: Fig. 24 illustrates the application of this method to a pair of 2A3's operated at E_c =300 volts. Each tube has a plate-dissipation rating of 15 watts. The method is to erect a vertical line at 0.6E_o, or at 180 volts, which intersects the E_c =0 curve at the point I_{max} =0.26 ampere. Using the simplified formulas, we obtain

 $R_{\rm PD} = (1.6 \times 300)/0.26 = 1845 \ {\rm obms}$ $P_0 = (0.26 \times 300)/5 = 15.6 \ {\rm watts}$

At this point, it is well to determine the plate dissipation and to compare it with the maximum rated value. From the average plate current formula (0.636 Innax) mentioned previously, the maximum-signal average plate current is 0.166 ampere. The product of this current and the operating plate voltage is 49.8 watts, the average input to the two tubes. From this value, subtract the

power output of 15.6 watts to obtain the total dissipation for both tubes which is 34.2 watts. Half of this value, 17 watts, is in excess of the 15-watt rating of the tube and it is necessary, therefore, to assume another and higher load resistance so that the plate-dissipation rating will not be exceeded.

It will be found that at an operating plate voltage of 300 volts the 2A3's require a plate-to-plate load resistance of 3000 ohms. From the formula for $\rm R_{DP}$ the value of I' is found to be 0.4 ampere. The load line for the 3000-ohm load resistance is then represented by a straight line from the point I'=0.4 ampere on the plate-current ordinate to the point $\rm E_o=300$ volts on the plate-voltage abscissa. At the intersection of the load line with the zero-bias curve, the peak plate current, $\rm I_{max}$, can be read at 0.2 ampere. Then $\rm P_{OP}=(I_{max}/\sqrt{2})$? $\rm X_{PDP}/4$

maximum-signal average power input is

 $P_0 = (Imax/\sqrt{2})^2 \times Rpp/4$ = $(0.2/1.41)^2 \times 3000/4$ = 15 watts Proceeding as in the first approximation, we find that the maximum-signal average plate current, 0.636I_{max}, is 0.127 ampere, and the maximum-signal average power input is 38.1 watts. This input minus the power output is 38.1 - 15= 23.1 watts. This value is the dissipation for two tubes; the value per tube is 11.6 watts, a value well within the rating of

taken from Fig. 24. Values of grid bias are read from each of the grid-bias curves of Fig. 24 along the load line and are transferred to Fig. 25 to produce the curved line from A to C. A tangent to this curve, starting at A, is drawn to intersect the grid-voltage abscissa. The point of intersection, B, is the operating grid bias for fixed-bias operation. In the conditions of plate volts=300 and grid bias = -60 volts; the zero-signal plate current per tube is seen to be 0.04 signal plate current may now be found by use of a curve which is derived from plate current and de grid-bias voltages example, the bias is -60 volts. Refer back to the plate family at the operating The operating bias and the zerothe plate family and the load line. Fig. 25 is a curve of instantaneous values of this tube type.

ampere. This procedure locates the operating point for each tube at P. The plate cur-

rent must be doubled, of course, to obtain the zero-signal plate current for both tubes. Under maximum-signal conditions, the signal voltage swings from zero-signal bias voltage to zero bias for each tube on alternate half cycles. Hence, in the example, the peak af signal voltin the signal volts, or the grid-togrid value is 120 volts.

may be larger than permissible, can be found by means of composite characteristic curves. A complete family of curves pose only the one corresponding to a age swing is needed. In the example, the below the operating grid and plate As in the case of the push-pull class tion in a class AB, amplifier using triodes harmonic distortion, however, which can be plotted, but for the present purgrid bias of one-half the peak grid-voltand the half value is 30 volts. The composite curve, since it is nearly a straight ine, can be constructed with only two points (see Fig. 24). These two points is very small and is largely canceled by virtue of the push-pull connection. Thirdpeak grid voltage per tube is 60 volts, are obtained from deviations above and A amplifier, the second-harmonic distor-

the (-60) - (-30) = -30-volt bias curve and read the plate current at this inter-(-30) = -90-volt bias curve, read the Similarly, another point F on the same In order to find the curve for a bias of -30 volts, we have assumed a deviation of 30 volts from the operating grid viation from the operating plate voltage of, say, 40 volts. Then at 300 - 40 = 260volts, erect a vertical line to intersect section, which is 0.167 ampere; likewise, at the intersection of a vertical line at plate current. In this example, the plate current is estimated to be 0.002 ampere. The difference of 0.165 ampere between these two currents determines the point composite curve is found by assuming the same grid-bias deviation but a larger plate-voltage deviation, say, 100 volts. 300 + 40 = 340 volts and the (-60) + voltage of -60 volts. Next assume a de-E on the 300-40=260-volt vertical

Proceedings deviation, say, 100 voits. We now have points at 260 volts and 0.165 ampere (E), and at 200 volts and 0.045 ampere (F). A straight line through these points is the composite curve for a bias of -30 volts, shown as a

long-short dash line in Fig. 24. At the intersection of the composite curve and the load line, G, the instantaneous composite plate current at the point of one-half the peak signal swing is determined. This current value, designated Lo., and the peak plate current, Imax, are used in the following formula to find peak value of the third-harmonic component of the plate current.

Ib = (2Io.; - Imax)/9

In the example, where $I_{o.s}$ is 0.097 ampere and I_{max} is 0.2 ampere, $I_{hs} = (2 \times 0.097 - 0.2)/3 = (0.194 - 0.2)/3 = -0.006$, 3 = -0.002 ampere. (The fact that I_{hs} is negative indicates that the phase relation of the fundamental (first-harmonic) and third-harmonic components of the plate current is such as to result in a slightly peaked wave form. I_{hs} is positive in some cases, indicating a flattening of the wave form.)

The peak value of the fundamental or first-harmonic component of the plate current is found by the following formula:

Ib₁ = $2/3 \times (Imax + Ia.s)$

In the example, $I_{11} = 2/3 \times (1max + 1a4)$ 0.097) = 0.198 ampere. Thus, the percentage of third-harmonic distortion is $(I_{13}/I_{11}) \times 100 = (0.002/0.198) \times 100 = 1$ per cent approx.

Class AB₂ Power Amplifiers

A class AB₂ amplifier employs two tubes connected in push-pull as in the case of class AB, amplifiers. It differs in that it is biased so that plate current flows for somewhat more than half the electrical cycle but less than the full cycle, the peak signal voltage, grid current in than the dc bias voltage, grid current is drawn, and consequently, power is consumed in the grid circuit. These conditions permit high power output to be obtained without excessive plate dissipation.

The sum of the power used in the grid circuit and the losses in the input transformer is the total driving power required by the grid circuit. The driver stage should be capable of a power output considerably larger than this required power in order that distortion introduced in the grid circuit be kept low. In addition, the internal impedance of the driver stage as reflected into or as

low. The input transformer used in a effective in the grid circuit of the power stage should always be as low as possible class AB₂ stage usually has a step-down ratio adjusted for this condition. in order that distortion may be kept

If the load resistance is too high or the ing power; a satisfactory set of operating swing are limited by the permissible grid signal swing is excessive, the plate-dissipation rating will be exceeded, distortion tions are similar to those for class AB. These quantities are interdependent with peak grid-voltage swing and drivmations. The load resistance and signal will be high, and the driving power will Load resistance, plate dissipation, power output, and distortion determinaconditions involves a series of approxicurrent and power, and the distortion be unnecessarily high

Class B Power Amplifiers

Because of this low value of no-signal plate current, class B amplification has the signal swing is usually larger than in large power output can be obtained without excessive plate dissipation. Class B operation differs from class AB₂ in that plate current is cut off for a larger portion of the negative grid swing, and A class B amplifier employs two tubes connected in push-pull, so biased the same advantage as class AB2, i.e., that plate current is almost zero when no signal voltage is applied to the grids. class AB₂ operation.

tion, considerable grid current is drawn circuit. This condition imposes the same class AB2 stage; i.e., the driver should Because certain triodes used as class close to zero bias, the grid of each tube requirement in the driver stage as in a be capable of delivering considerably quired for the grid circuit of the class B amplifier so that distortion will be low. tween the driver and the class B stage cause of the high dissipations involved in class B operation at zero bias, it is not is at a positive potential during all or most of the positive half-cycle of its signal swing. In this type of triode operaand there is a loss of power in the grid Similarly, the interstage transformer beisually has a step-down turns ratio. Be-B amplifiers are designed to operate very more power output than the power re-

feasible to use tetrodes or pentodes in this type of class B operation.

tortion is similar to that for a class AB, Determination of load resistance, plate dissipation, power output, and dis-

quired. A number of class B amplifier nected in push-pull so that only one tube is required for a class B stage. An example of a twin triode used in class B class A operation can be used in class AB₁ and class B service under suitable operating conditions. There are several tube types designed especially for class B service. The characteristic common to all of these types is a high amplification factor. With a high amplification factor, bias is zero. These tubes, therefore, can be operated in class B service at a bias in one tube. The two units can be con-Power amplifier tubes designed f**or** plate current is small even when the grid of zero volts so that no bias supply is retubes consist of two triode units mounted service is the 6N7.

modulation distortion should be less than 2 per cent at the desired listening level.

ence of the interacting frequencies. Inter-

High-Fidelity Amplifiers

Several high-fidelity amplifiers are frequency response, total harmonic distortion, maximum power output, and amplifiers are usually given in terms of shown in the CIRCUITS SECTION. The performance capabilities of such noise level.

ts frequency response is flat within 1 db To provide high-fidelity reproducwhich does not vary more than 1db over practice is to design the amplifier so that from a frequency below the lowest to be reproduced to one well above the upper tion of audio program material, an amplifier should have a frequency response the entire audio spectrum. General imit of the audible region.

present in the program material. For high-fidelity reproduction, total harage of the output power) should not be greater than about 1 per cent at the de-Harmonic distortion and intermodprogram material which may have adverse effects on the quality of the reproduced sound. Harmonic distortion causes a change in the character of an individual tone by the introduction of harmonics which were not originally monic distortion (expressed as a percentulation distortion produce changes in

sired listening level. Types such as the 6973, 7027A and 7868 are designed to provide extremely low harmonic distorgion in suitably designed push-pull amplifier circuits.

other tone present at the same time in the change in the waveform of an individual cone as a result of interaction with antion not only alters the character of the modulated tone, but may also result in the generation of spurious signals at frequencies equal to the sum and differprogram material. This type of distor-Intermodulation distortion is

The maximum power output which a high-fidelity amplifier should deliver In general, any amplifier which has low intermodulation distortion will have very ow harmonic distortion.

mine amplifier requirements in terms of eral factors, including the size and acousthe desired listening level, and the efficiency of the loudspeaker system. Practically, however, it is possible to deterdepends upon a complex relation of sevtical characteristics of the listening area, room size and loudspeaker efficiency.

average-size living room is about 0.4 watt. Because high-fidelity loudspeakers use have an efficiency of only about 5 of the type generally available for home fier should therefore be able to deliver a power output of at least 8 watts. Bedivider networks, have efficiencies of less than 5 per cent, output tubes used with arger power outputs. The 6973, 7027A, The acoustic power required to reproduce the loudest passages of orchestral music at concert-hall level in the per cent, the output stage of the amplicause many wide-range loudspeaker systems, particularly those using frequencysuch systems must have correspondingly 7189, and 7868 can provide ample outout for most systems when used in suitable push-pull circuits.

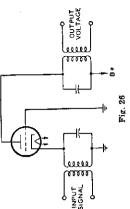
the greatest volume range utilized in electrical program material at the present amplifier determines the range of volume the difference (usually expressed in decibels) between the loudest and softest sounds in program material. Because The noise level of a high-fidelity the amplifier is able to reproduce, i.e.,

time is about 60 db, the noise level of a high-fidelity amplifier should be at least 60 db below the signal level at the desired listening level.

Cathode-Drive Circuits

the input and output circuits. Tubes circuit arrangements which utilize the Probably the most important of these The preceding text has discussed the use of tubes in the conventional grid-drive type of amplifier-that is, where the cathode is common to both may also be employed as amplifiers in amplifiers are the cathode-drive circuit, which is discussed below, and the cathode-follower circuit, which will be discussed later in connection with inverse grid or plate as the common terminal. eedback.

A typical cathode-drive circuit is shown in Fig. 26. The load is placed in



performance usually associated with a drive circuit would be unstable because of feedback through the grid-to-plate drive circuit, the grounded grid serves as a capacitive shield between plate and cathode and permits stable operation at frequencies higher than those in which impedance in the cathode circuit. The cathode-drive circuit is particularly useful for vhf and uhf applications, in which it is necessary to obtain the low-noise capacitance of the tube. In the cathodethe plate circuit and the output voltage The grid is grounded, and the input voltage is applied across an appropriate triode, but where a conventional gridis taken off between the plate and ground as in the grid-drive method of operation. conventional circuits can be used.

compared to the r_p of the tube. A certain The input impedance of a cathodedrive circuit is approximately equal to 1/gm when the load resistance is small

Electron Tube Applications

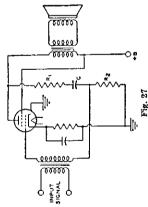
to drive such a circuit. However, in the type of service in which cathode-drive circuits are normally used, the advantages of the grounded-grid connection amount of power is required, therefore, usually outweigh this disadvantage.

Inverse Feedback

times called a degenerative circuit, is back are: (1) reduced distortion from cuit and (2) reduction in the variations An inverse-feedback circuit, someone in which a portion of the output voltage of a tube is applied to the input of the same or a preceding tube in opposite phase to the signal applied to the tube. Two important advantages of feedeach stage included in the feedback cirin gain due to changes in line voltage, possible differences between tubes of the same type, or variations in the values of circuit constants included in the feedoack circuit.

can be reduced by means of inverse feedback, Inverse-feedback circuits are of the constant-voltage type and the output stage where the load impedance on the tube is a loudspeaker. Because constant for all audio frequencies, the with frequency. When the output tube plate load impedance can, if not corrected, produce considerable frequency Inverse feedback is used in audio amplifiers to reduce distortion in the the impedance of a loudspeaker is not load impedance on the output tube varies is a pentode or beam power tube having high plate resistance, this variation in distortion. Such frequency distortion constant-current type.

voltage type of inverse feedback to a power output stage using a single beam power tube is illustrated by Fig. 27. In this circuit, R., R., and C are connected The application of the constantas a voltage divider across the output of



blocks the dc plate voltage from the to the output voltage multiplied by the input transformer is returned to a point on this voltage divider. Capacitor C grid. However, a portion of the tube's af output voltage, approximately equal fraction $R_2/(R_1 + R_2)$, is applied to the grid. This voltage lowers the source impedance of the circuit and a decrease in distortion results which is explained in the tube. The secondary of the gridthe curves of Fig. 28.

to the grid the af plate current i'n has an This irregularity represents a departure and is, therefore, distortion. For this plate-current waveform, the af plate Consider first the amplifier without that when a signal voltage eg is applied from the waveform of the input signal the use of inverse feedback. Suppose irregularity in its positive half-cycle.

is the difference between the drop across age goes down; when plate current goes voltage has a waveform shown by e'_{p} . The plate-voltage waveform is inverted compared to the plate-current waveform because a plate-current increase produces an increase in the drop across the plate load. The voltage at the plate the load and the supply voltage; thus, when plate current goes up, plate voltdown, plate voltage goes up.

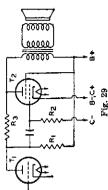
the grid is as shown by e'gt. This voltage is applied to the amplifier. The voltage form and phase as the plate voltage, but is smaller in magnitude. Hence, with a e'p, the feedback voltage appearing on nent of plate current i'n. It is evident this component of plate current would act to cancel the original irregularity Now suppose that inverse feedback ed back to the grid has the same waveapplied to the grid produces a compothat the irregularity in the waveform of plate voltage of waveform shown by and thus reduce distortion.

solid curve of ip. Since i'p is the plate current that would flow without inverse plied, the relations are as shown in the curve for ip. The dotted curve shown by pt is the component of plate current The dotted curve shown by i'p is the component of plate current due to the signal voltage on the grid. The algebraic sum of these two components gives the resultant plate current shown by the leedback, it can be seen that the application of inverse feedback has reduced the irregularity in the output current. In this manner inverse feedback acts to correct any component of plate current that does not correspond to the input signal voltage, and thus reduces dis-After inverse feedback has been apdue to the feedback voltage on the grid. cortion.

From the curve for ip, it can be seen inverse feedback is applied to an amplithat more driving voltage be applied to that, besides reducing distortion, inverse feedback also reduces the amplitude of the output current. Consequently, when fier there is a decrease in gain or power sensitivity as well as a decrease in distortion. Hence, the application of inverse feedback to an amplifier requires obtain full power output, but this output is obtained with less distortion.

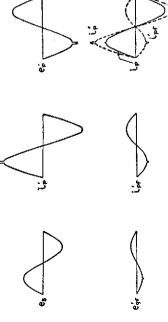
be applied to push-pull class A and class plied to resistance-coupled stages as age of T, and a portion of the output signal voltage of T, appears across R, Because the distortion generated in the out of phase with the input signal, the distortion in the output of T2 is comparatively low. With sufficient inverse feedback of the constant-voltage type sary to employ a network of resistance and capacitance in the output circuit to reduce response at high audio frequencies. Inverse-feedback circuits can also Inverse feedback may also be apshown in Fig. 29. The circuit is conventional except that a feedback resistor, Rs. is connected between the plates of tubes T. and T. The output signal voltplate circuit of T₂ is applied to its grid in a power-output stage, it is not neces-AB, amplifiers.

Constant-current inverse feedback is usually obtained by omitting the bypass capacitor across a cathode resistor.



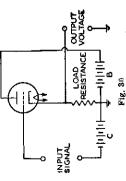
This method decreases the gain and the the output voltage rises at the resonant frequency of the loudspeaker and acdistortion but increases the source impedance of the circuit. Consequently, centuates hangover effects.

as the 2A3, because the variation in speaker impedance with frequency does not produce much distortion in a triode stage having low plate resistance. It is sometimes applied in a pentode stage but is not always convenient. As has shown, when inverse feedback is used in an amplifier, the driving voltage power output. When inverse feedback is voltage required for full power output may be inconveniently large, although still less than that required for a triode. must be increased in order to give full used with a pentode, the total driving Because a beam power tube gives full Inverse feedback is not generally applied to a triode power amplifier, such peen



Cathode-Follower Circuits

Another important application of inverse feedback is in the cathode-follower circuit, an example of which is given in Fig. 30. In this application, the circuit to the cathode circuit of the tube.



The input voltage is applied between the grid and ground and the output voltage is obtained between the cathode and ground. The voltage amplification (V.A.) of this circuit is always less than unity and may be expressed by the following convenient formulas.

For a triode:

V. A. =
$$\frac{\mu \times R_L}{r_D + [R_L \times (\mu + 1)]}$$

For a peniode:

 $V.A. = \frac{gm \times R_L}{1 + (gm \times R_l)}$ In these formulas, μ is the amplification factor, RL is the load resistance in ohms, r_p is the plate resistance in ohms, and g_m is the transconductance

in mbos.

The use of the cathode follower perhigs the design of circuits which have high input resistance and high output voltage. The output impedance is quite tow and very low distortion may be obtained. Cathode-follower circuits may be used for power amplifiers or as impedance transformers designed either to match a transmission line or to produce a relatively high output voltage at a low

mpedance level. In a power amplifier which is transormer coupled to the load, the same

tube as would be obtained from the tube as would be obtained in a conventional grid-drive type of amplifier. The output impedance is very low and provides excellent damping to the load, with the result that very low distortion can be obtained. The peak-to-peak signal voltage, however, approaches $1\frac{1}{2}$ mimes the plate supply voltage if maximes the plate supply voltage if maximum power output is required from the tube. Some problems may be encountered, therefore, in the design of an adequate driver stage for a cathode-follower output system.

When a cathode-follower circuit is used as an impedance transformer, the load is usually a simple resistance in the cathode circuit of the tube. With relatively low values of cathode resistor, the circuit may be designed to supply significant amounts of power and to match the impedance of the device to a transmission line. With somewhat higher values of cathode resistor, the circuit may be used to lower the output impedance sufficiently to permit the transmission of audio signals along a line in which appreciable capacitance is present.

The cathode follower may also be used as an isolation device to provide extremely high input resistance and low input capacitance as might be required in the probe of an oscilloscope or vacuum-tube voltmeter. Such circuits can be designed to provide effective impedance transformation with no significant loss of voltage.

Selection of a suitable tube and its operating conditions for use in a cathode-follower circuit having a specified output impedance (Z₀) can be made, in most practical cases, by the use of the following formula to determine the approximate value of the required tube transconductance.

Required gm
$$(\mu mhos) = \frac{1,000,000}{Z_0 (ohms)}$$

Once the required transconductance is obtained, a suitable tube and its operating conditions may be determined from the technical data given in the TUBE TYPES SECTION. The tube selected should have a value of transconductance slightly lower than that obtained from the above expression to allow for the shunting effect of the cathode load resistance. The conversion

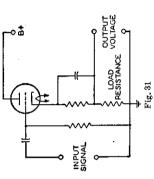
nomograph given in Fig. 23 may be and used for calculation of operating conditions for values of transconductance not following for values of transconductance not following conditions have been determined, the approximate value of the term required cathode load resistance may be tancellulated from the following formulas.

Cathode
$$R_L = \frac{Z_O \times r_D}{[Z_O \times (1+\mu)]}$$

For periode:

Cathode $R_L = \frac{Z_O}{1 - (gm \times Z_O)}$ Resistance and impedance values are in ohms; transconductance values are in If the value of the cathode load resistance calculated to give the required output impedance does not give the required operating bias, the basic cathode-follower circuit can be modified in a number of ways. Two of the more common modifications are given in Figs. 31 and 32.

In Fig. 31 the bias is increased by adding a bypassed resistance between the cathode and the unbypassed load resistance and returning the grid to the low end of the load resistance. In Fig. 32 the bias is reduced by adding a bypassed resistance between the cathode and the unbypassed load resistance but, in this case, the grid is returned to the junction of the two cathode resistors so that the bias voltage is only the de voltage drop across the added resistance. The size of



the bypass capacitor should be large enough so that it has negligible reactance at the lowest frequency to be handled. In both cases the B-supply should be increased to make up for the voltage taken for biasing.

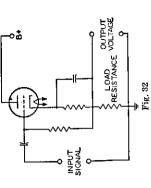
Example: Select a suitable tube

Electron Tube Applications -

and determine the operating conditions and circuit components for a cathode-follower circuit having an output impedance that will match a 500-ohm transmission line. Procedure: First, determine the approximate transconductance required.

Required gm =
$$\frac{1,000,000}{500}$$
 = 2000 µmhos

A survey of the tubes that have a transconductance in this order of magnitude shows that type 12AX7 is among



the tubes to be considered. Referring to the characteristics given in the technical data section for one triode unit of highmu twin triode 12AX7, we find that for a plate voltage of 250 volts and a bias of -2 volts, the transconductance is 1600 micromhos, the plate resistance is 62500 ohms, the amplification factor is 100, and the plate current is 0.0012 ampered. When these values are used in the expression for determining the cathode load resistance, we obtain

Cathode $R_L = \frac{500 \times 62500}{62500 - 500 \times (100 + 1)} = 2600 \text{ obms}$

creased by the voltage drop across the $2600 \times 0.0012 = 3.12$ volts. Because the is employed. The bias is furnished by a ance, therefore, is 2/0.0012 = 1670cathode resistance which, in this examresistance that will have a voltage drop 0.0012 ampere. The required bias resistohms. If 60 cycles per second is the lowfarads is a suitable value for the bypass capacitor. The B-supply, of course, is in-The voltage across this resistor for a plate current of 0.0012 ampere is required bias voltage is only -2 volts, the circuit arrangement given in Fig. 32 of 2 volts when it carries a current of est frequency to be passed, 20 micro-

ple, is approximately 5 volts. The Bsupply, therefore, is 250 + 5 = 255 volts. Because it is desirable to eliminate,

an amplification factor of 70, a plate if possible, the bias resistor and bypass capacitor, it is worthwhile to try other tubes and other operating conditions to high-mu triode 6AT6 is operated under volts and a bias of -1 volt, it will have ductance of 1300 micromhos, and a plate obtain a value of cathode load resistance which will also provide the required bias. the conditions given in the technical data section with a plate voltage of 100 resistance of 54000 ohms, a transcon-If the triode section of twin diode current of 0.0008 ampere. Then,

Cathode $R_L = \frac{600 \times 64000}{54000 - 500 \times (70 + 1)} = 1460 \text{ ohms}$ 500×54000

The bias voltage obtained across or the drop in the cathode resistor. The this resistance is $1460 \times 0.0008 = 1.17$ volts. Since this value is for all practical purposes close enough to the required bias, no additional bias resistance will be required and the grid may be returned directly to ground. There is no need to adjust the B-supply voltage to make up voltage amplification (V.A.) for cathode-follower circuit utilizing triode section of type 6AT6 is

 $V.A. = \frac{10.0 \times 1400}{54000 + 1460 \times (70 + 1)} = 0.65$ 70×1460

consideration. In such applications it is of cathode load resistance, such as 50,000 not impedance matching is the primary desirable to use a relatively high value ohms, in order to get the maximum voltage output. In order to obtain proper should be used. With a high value of cathode resistance, the voltage amplifi-For applications in which the cathode follower is used to isolate two circuits—for example, when it is used between a circuit being tested and the input stage of an oscilloscope or a vacuum-tube voltmeter—voltage output and bias, a circuit such as that of Fig. 32 cation will approximate unity.

Corrective Filters

A corrective filter can be used to tube or a pentode when inverse feedback an output stage using a beam power is not applicable. The filter consists of a resistor and a capacitor connected in improve the frequency characteristic of

with increasing frequency in the middle of the filter, however, decreases with increasing frequency. It follows that by the effective load impedance on the output tubes can be made practically constant for all frequencies in the middle and upper audio range. The result is an improvement in the frequency characseries across the primary of the output transformer. Connected in this way, the fiter is in parallel with the plate load by the output transformer. The magnitude of this reflected impedance increases and upper audio range. The impedance use of the proper values for the resistance and the capacitance in the filter, impedance reflected from the voice-coil teristic of the output stage.

ter for a push-pull stage is 1.3 times the sistance. The capacitance in the filter age gain of the output stage at a frequency of 1000 cycles or higher is equal The resistance to be used in the filrecommended plate-to-plate load resistance; or, for a single-tube stage, is 1.3 times the recommended plate load reshould have a value such that the voltto the voltage gain at 400 cycles.

A method of determining the proper value of capacitance for the filter is to make two measurements of the output voltage across the primary of the output transformer: first, when a 400-cycle signal is applied to the input, and second, when a 1000-cycle signal of the same voltage as the 400-cycle signal is applied to the input. The correct value of capacitance is the one which gives equal output voltages for the two signal inputs. In practice, this value is usually found to be in the order of 0.05 microfarad.

Volume Compressors and Expanders

Volume compression and expansion

an excessively high volume level. It is are used in FM transmitters and receivers and in recording devices and amplifiers to make more natural the reproduction of music which has a very large volume range. For example, in the music tensity of the soft passages is very much ower than that of the loud passages. When this low volume level is raised mitting or recording, the peak level of the program material may be raised to of a symphony orchestra the sound inabove the background noise for trans-

often necessary, therefore, to compress the volume range of the program content within the maximum capabilities of vice. Exceeding a maximum peak volume level for FM modulation corresponds to exceeding the allowed bandwidth for transmission. In some recording devices, excessive peak volume levels may the FM transmitter or the recording decause overloading and distortion.

complished by either manual or automatic control. The types of compression ters, and volume compressors. A peak age signal level above a predetermined volume compressors can be correctly Volume compression may be acused include peak limiters, volume limimiter limits the peak power to some predetermined level. A volume limiter provides gain reduction based on an averevel. A volume compressor provides gain reduction for only the sustained loud portions of the sound level. Only compensated for with volume expanders.

For faithful reproduction of the FM transmitter or recording device. In general, the basic requirements for either a volume compressor or expander are original sound, the volume expander used in the FM receiver or audio amplitic of the volume compressor used in the fier should have the reverse characterisshown in the block diagram of Fig.

OUTPUT V3 RECTIFIER VARIABLE-GAIN AMPLIFIER Fig. 33 V2 Amplifier

gain amplifier V₁ has greater gain for a amplitude signal; therefore, soft passages are amplified more than loud ones. In an expander, the gain is greater for highamplitude signals than for low-amplitude signals; therefore, loud passages are amplified more than soft ones and the In a volume compressor, the variablelow-amplitude signal than for a highoriginal amplitude ratio is restored.

In the diagram shown in Fig. 33, the

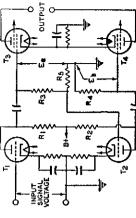
in signal amplitude, the gain of V₁ also signal to be amplified is applied to V₁, and a portion of the signal is also applied to V₂. The amplified output from V₂ is then rectified by V₃, and applied as a negative (for compressors) or positive (for expanders) bias voltage to V₁. As this bias voltage varies with variations varies to produce the desired compression or expansion of the signal.

Electron Tube Applications ==

desirable effects which may occur in Tubes having a large dynamic range provide the best results in volume compressor or expander applications. Examples of such types are the 6BJ6 and 6BE6. Push-pull operation is generally desired for the variable-gain amplifier to prevent high distortion and other unvolume compressors and expanders.

Phase Inverters

a push-pull stage swings the grid of one tube in a positive direction, it should swing the grid of the other tube in a negative direction by a similar amount. stages, the out-of-phase input voltage to the push-pull stage is supplied by means of the center-tapped secondary. With put voltage is obtained by means of the Thus, when the signal voltage input to With transformer coupling between resistance coupling, the out-of-phase insignal-voltage inputs to the grids of a push-pull stage must be 180 degrees out of phase and approximately equal in provide resistance coupling between the or a phase inverter arises because the amplitude with respect to each other. A phase inverter is a circuit used to output of a signal-tube stage and the input of a push-pull stage. The necessity nverter action of a tube.



amplifier, resistance-coupled by means Fig. 34 shows a push-pull power

of a phase-inverter circuit to a singlestage triode T. Phase inversion in this circuit is provided by triode T. The output voltage of T. is applied to the grid of triode Ts. A portion of the output voltage of T is also applied through the resistors R, and R, to the grid of Ts. The output voltage of T, is applied to the grid of triode T_s.

When the output voltage of Travings in the positive direction, the plate current of Travinceases. This action increases the voltage drop across the plate resistor Rrand swings the plate of Travin the negative direction. Thus, when the output voltage of Travings positive, the output voltage of Travings negative and is, therefore, 180° out of phase with the output voltage of Travings negative the output voltage of Travings negative

In order to obtain equal voltages at Es and Eb, (Rs+Rs)/Rs should equal the voltage gain of T₂. Under the conditions where a twin-type tube or two used at T1 and T2, R4 should be equal to R:+R, to R, should be the same as the PLED AMPLIFIER SECTION. In the tubes having the same characteristics are voltage gain ratio of T2 in order to apply the correct value of signal voltage to T₂. The value of Ris, therefore, equal to R. R. plus R., and R. may be taken from the sum of R, and R. The ratio of divided by the voltage gain of T2; R8 is equal to Reminus R. Values of R., R., the chart in the RESISTANCE-COUpractical application of this circuit, it is convenient to use a twin-triode tube combining T₁ and T₂.

Tone Controls

A tone control is a variable filter (or one in which at least one element is adjustable) by means of which the user may vary the frequency response of an amplifier to suit his own taste. In radio receivers and home amplifiers, the tone control usually consists of a resistance-capacitance network in which the resistance is the variable element.

The simplest form of tone control is a fixed tone-compensating or "equalizing" network such as that shown in Fig. 35. This type of network is often used to equalize the low- and high-frequency response of a crystal phonograph pickup. At low frequencies the attenuation of this network is 20,8 db, As

the frequency is increased, the 100-micromicrofarad capacitor serves as a bypass for the 5-megohm resistor, and the combined impedance of the resistor-capacitor network is lowered. Thus, more

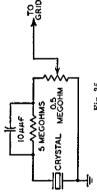
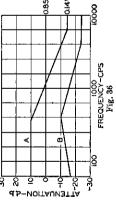
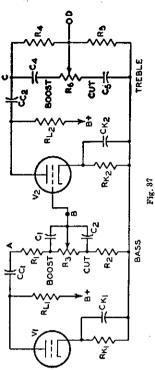


Fig. 35
of the crystal output appears across the 0.5-megohm resistor at high frequencies than at low frequencies, and the frequency response at the grid is reasonably flat over a wide frequency range. Fig. 36 shows a comparison between the output of the crystal (curve A) and the output of the equalizing network (curve B). The response curve can be "flattened" still more if the attenuation at low frequencies is increased by changing the 0.5-megohm resistor to 0.125 megohm.



shows simplified representations of the trolling factor. For bass "boost", the parallel combination is shifted so that The tone-control network shown in Fig. 37 has two stages with completely equalizing network shown in Fig. 35, put to grid B at high frequencies than at low frequencies. For bass "cut," the sentially, the network is a variable-frequency voltage divider. With proper separate bass and treble controls. Fig. 38 bass control of this circuit when the potentiometer is turned to its extreme variations (usually labeled "Boost" and "Cut"). In this network, as in the crystalthe parallel RC combination is the concapacitor C₂ bypasses resistor R_s so that less impedance is placed across the out-C₁ bypasses R₃, causing more high-frequency than low-frequency output. Es-

0-mia byof the



values for the components, it may be made to respond to changes in the R₃ potentiometer setting for only low frequencies (below 1000 cycles).

BASS BOOST

RASS CUT

RAS

Fig. 39 shows extreme positions of the treble control. The attenuation of the two circuits is approximately the same at 1000 cycles. The treble "boost" circuit is similar to the crystal-equalizing network shown in Fig. 35. In the treble "cut" circuit, the parallel RC elements serve to attenuate the signal volage further because the capacitor bypasses the resistance across the output.

The effect of the capacitor is negligible at low frequencies; beyond 1000 cycles, the signal voltage is attenuated at a maximum rate of 6 db per octave.

The location of a tone-control network is of considerable importance. In a typical radio receiver, it may be inserted

in the plate circuit of the power tube, the coupling circuit between the first af amplifier tube and the power tube, or the grid circuit of the first tube. In an primary of the output transformer. This amplifier using a beam power tube or pentode power amplifier without negative feedback, it is desirable to connect a resistance-capacitance filter across the ilter may be fixed, with a supplemenary tone control elsewhere, or it may the tone control may be inserted in the is external to the feedback loop. The feedback network or else should be conover-all gain of a well designed tone-control network should be approximately form the tone control itself. If the amplifier incorporates negative feedback, nected to a part of the amplifier which unity.

Phonograph and Tape Preamplifiers

The frequency range and dynamic pend on several factors, including the of the recording equipment. To achieve composition, mechanical characteristics, and speed of the record or tape, and the electrical and mechanical characteristics manufacturers of commercial recordings uniform relationship between amplitude Po assure proper reproduction of a highof the reproducing system must have a istic. Most manufacturers of high-fidelity phonic" (RIAA) characteristic for discs range which can be recorded on a phonograph record or on magnetic tape dewide frequency and dynamic ranges, use equipment which introduces a non-This relationship is fidelity recording, therefore, some part requency-response characteristic which is the inverse of the recording characterrecordings use the RCA "New Orthoknown as a "recording characteristic." and frequency

and the NARTB characteristic for mag-

Some typical preamplifier stages producing system will depend on the types of recordings which are to be re-The location of the frequency-compensating network or "equalizer" in the reproduced and on the pickup devices used. are shown in the CIRCUITS SECTION

pickup is usually designed to provide cording characteristic when the pickup A ceramic high-fidelity phonograph work or a preamplifier, and can be con-nected directly to the input of a toneproper compensation for the RIAA reis operated into the load resistance specfied by its manufacturer. Because this type of pickup also has relatively high output (0.5 to 1.5 volts), it does not require the use of either an equalizer netcontrol amplifier and/or power amplifier.

A magnetic high-fidelity phonograph pickup, on the other hand, usually sponse characteristic and very low output (1 to 10 millivolts). Because a pickup as by a preamplifier having sufficient voltage gain to provide the input voltage and/or power amplifier. Many designs include both the equalizing and amplihas an essentially flat frequency-reof this type merely reproduces the relowed by an equalizer network, as well required by the tone-control amplifier cording characteristic, it must be follying circuits in a single unit.

pickup, reproduces the recording characteristic and has an output of only a vice, therefore, must also be followed by A high-fidelity magnetic-tape pickup head, like a magnetic phonograph few millivolts. This type of pickup deby a preamplifier which provides "built-in" equalization for the NARTB an equalizing network and preamplifier characteristic.

Limiters

turbances from being reproduced in the the input to the detector. Because in an An amplifier may also be used as a ers designed for the reception of frequency-modulated signals. The limiter eliminating amplitude variations from FM system amplitude variations are the use of a limiter prevents such dislimiter. One use of a limiter is in receivin FM receivers has the function of primarily the result of noise disturbances,

audio output. The limiter usually follows the last if stage so that it can minimize the effects of disturbances coming in on the rf carrier and those produced

operation. Saturated operation means crease in plate current. A signal voltage weak signals, is supplied to the limiter input by the preceding stages. Any change in amplitude, therefore, such as that an increase in signal voltage above which is never less than sufficient to cause saturation of the limiter, even on might be produced by noise voltage fuctuation, is not reproduced in the limiter output. The limiting action, of The limiter is essentially an if voltage amplifier designed for saturated a certain value produces very little incourse, does not interfere with the reproduction of frequency variations. locally.

plate and grid-No.2 voltages which are Plate-current saturation of the limiter may be obtained by the use of grid-No.1-resistor-and-capacitor bias with low compared with customary if-amplifier operating conditions.

quency-modulated if voltage, the mean plifier. This voltage is impressed on the the limiter is able to maintain its output voltage at a constant amplitude over a wide range of input-signal voltage variations. The output of the limiter is frefrequency of which is that of the if am-As a result of these design features, input of the detector.

In a high-fidelity receiver, therefore, the kilocycles wide. Suitable tubes for this out serious distortion requires that the response of the receiver be such that stant depends on the modulation at that instant, it follows that excessive attenuthe rf or if stages, will cause distortion. The reception of FM signals withsatisfactory amplification of the signal is provided over the entire range of frequency deviation from the mean frequency. Since the frequency at any ination toward the edges of the band, in amplifiers must be capable of amplifying, for the maximum permissible frequency deviation of 75 kilocycles, a band 150 purpose are the 6BA6 and 6BJ6.

Television RF Amplifiers

In a radio or television receiver, noise generated in the first amplifier

stage is often the controlling factor in determining the over-all sensitivity of the receiver. The "front end" of a receiver, therefore, is designed with special attention to both gain and noise charac-

is amplified, therefore, the thermal noise herently contains some thermal noise contributed by the resistive elements in the input device. When an input signal generated in the input circuit is also amplified. If the ratio of signal power to noise power (signal-to-noise ratio, S/N) is the same in the output circuit as in the input circuit, the amplifier is considered to be "noiseless" and is said to The input circuit of an amplifier inhave a noise figure of unity, or zero db.

amplifier stages generate a certain amount of noise as a result of thermal agitation of electrons in resistors and other components, minute variations in lect), and minute grid currents in the amplifier tubes. As a result, the ratio of signal power to noise power is inevitably ure of the degree of impairment is called signal In practical circuits, however, all the cathode emission of tubes (shot efand is expressed as the ratio of signal power to noise power at the output impaired during amplification. A measthe noise figure (NF) of the amplifier, (Si/Ni) divided by the ratio of power to noise power at the (So/No), as follows:

 $NF = \frac{(SI/NI)}{(So/So)}$

The noise figure in db is equal to ratio. For example, an amplifier having ten times the logarithm of this power a one-db noise figure decreases the signalto-noise ratio by a factor of 1.26, a 3-db noise figure by a factor of 2, a 10-db noise figure by a factor of 10, and a 20-db noise figure by a factor of 100.

Tuner input circuits of vhf television receivers use either a triode or a pentode in the rf amplifier stage. Such stages are required to amplify signals ranging from 55 to 216 Mc and having a bandwidth sure complete coverage of the band. In triodes were used because the grid-plate of 4.5 Mc, although the tuner is usually aligned for a bandwidth of 6 Me to asthe early rf tuners, pentodes rather than capacitance of triodes created stability problems. The use of twin triodes in

direct-coupled cathode-drive circuits makes it possible to obtain stable operation along with the low-noise character-Electron Tube Applications == istics of triodes.

grid-plate capacitance. An interstage impedance, usually an inductance in series with the plate of the first stage drive circuit provides both the gain and and the cathode of the second stage, is Pentodes or tetrodes do not provide the sensitivity of triodes because of the "partition noise" introduced by the screen grid. The direct-coupled cathodethe stability capabilities of the pentode and a low-noise triode input stage. Because the cathode-drive stage provides a low-impedance load to the groundedcathode stage, its gain is very low and there is no necessity for neutralizing the vide a degree of impedance matching between the units. The cathode-drive nput network and provides most of the often used at higher frequencies to proportion of the circuit is matched to the cathode capacitance, which in most cases stage gain. Because the feedback path of the cathode-drive circuit is the plateis very small, excellent isolation is provided between the antenna and the local oscillator.

ode ri circuit. The 6BN4 has been used tance to permit easier neutralization of a grounded-cathode circuit over the wide the feedback signal from the grid-plate Development of single triodes having low grid-plate capacitance has made possible the design of a neutralized tricommercially in neutralized triode cirnow in common usage, were specially designed to minimize grid-plate capacirequency band. The bridge-neutralized rf amplifier circuit has become widely used in television tuners. In this arrangement, a portion of the output signal is returned to the grid out of phase with capacitance. This circuit provides excelent gain and noise performance with cuits. Tubes such as the 6GK5 and 6CW4, stable operation across the band.

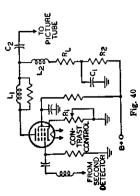
Video Amplifiers

tained in the video signal and, at the The video amplifier stage in a television receiver usually employs a pentode-type tube specially designed to amplify the wide band of frequencies consame time, to provide high gain per

triodes in such stages because they have high transconductance (to provide high gain) together with low input and output interelectrode capacitances (to permit the broadband requirements to be satisfied). An approximate "figure of merit" for a particular tube for this application can be determined from the ratio of its transconductance, gm, to the sum of its input and output capacitances, Cn and Cout, as follows:

Typical values for this figure are in the order of 500 x 10° or greater.

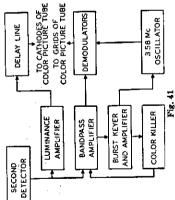
A typical video amplifier stage, such as that shown in Fig. 40, is connected between the second detector of the television receiver and the picture



value load resistor is used to provide and 12BY7A, or the pentode sections circuit controls the gain of the video amplifier tube. The inductance, L,, in coupling circuit, C.R., is used to improve as video amplifiers include types 6CL6 series with the load resistor, R, maintains the plate load impedance at a relatively constant value with increasing frequency. The inductance L. isolates the output capacitance of the tube so across the load. As a result, a higherhigher gain without affecting frequency tube. The contrast control, R., in this that only stray capacitance is placed response or phase relations. The dethe low-frequency response. Tubes used of types 6AW8A and 6AN8.

The luminance amplifier in a colortelevision receiver is a conventional video amplifier having a bandwidth of approximately 3.6 Mc. In a color receiver, the portion of the output of the second detector which lies within the frequency

band from approximately 2.4 to 4.5 Mc is fed to a bandpass amplifier, as shown in the block diagram in Fig. 41. The color



synchronizing signal, or "burst," contained in this signal may then be fed to a "burst-keyer" tube. At the same time, a delayed horizontal pulse may be applied to the keyer tube. The output of the keyer tube is applied to the burst amplifier tube and the signal is then fed to the 3.58-Mc oscillator and to the "color-killer" stage

The color killer applies a bias voltage to the bandpass amplifier in the absence of burst so that the color section, or chrominance channel, of the receiver remains inoperative during black-and-white broadcasts. A threshold control varies the bias and controls the burst level at which the killer stage operates.

The output of the 3.58-Mc oscillator and the output of the bandpass amplifier are fed into phase and amplitude demodulator circuits. The output of each demodulator circuits is an electrical representation of a color-difference signal, i.e., an actual color signal minus the black-and-white, or luminance, signal. The two color-difference signals are combined to produce the third color-difference signal; each of the three signals then represents one of the primary colors.

The three color-difference signals are usually applied to the grids of the three electron guns of the color picture tube, in which case the black-and-white signal from the luminance amplifer may be applied simultaneously to the cathodes. The chrominance and luminance signals then combine to produce the color picture. In the absence of trans-

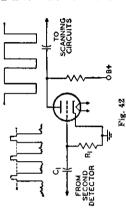
mitted color information, the chrominance channel is cut off by the color killer, as described above, and only the tuminance signal is applied to the picture, producing a black-and-white picture.

== Electron Tube Applications

Television Sync Circuits

In addition to picture information, the composite video signal supplied to a television receiver contains information to assure that the picture produced on the receiver is synchronized with the picture being viewed by the camera or pickup tube. The "sync" pulses, which have a greater amplitude than the video signal, trigger the scanning generators of the receiver when the electron beam of the pickup tube ends each trace.

The sync pulses in the composite video signal may be separated from the video information in the output of the second or video detector by means of the triode circuit shown in Fig. 42. In this circuit, the time constant of the network

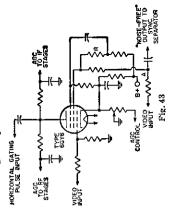


in the output. This sync-separator stage the advantage of being relatively indebetween pulses. During each pulse, the Consequently, the grid develops a bias which is slightly greater than the cutoff voltage of the tube. Because plate cur-R,C, is long with respect to the interval grid is driven positive and draws current, thereby charging capacitor C1. rent flows only during the sync-pulse period, only the amplified pulse appears discriminates against the video information. Because the bias developed on the grid is proportional to the strength of the incoming signal, the circuit also has pendent of signal fluctuations.

Because the electron beam scans the face of the picture tube at different rates in the vertical and horizontal directions, the receiver incorporates two different scanning generators. The repe-

tition rate of the vertical generator is 60 cycles per second, and the rate of the horizontal generator is approximately 15,760 cycles per second. The composite video signal includes information which enables each generator to derive its correct triggering. One horizontal sync pulse is supplied at the end of each horizontal line scan. At the end of each frame, several pulses of longer duration than the horizontal sync pulses are supplied to actuate the vertical generator. The vertical information is separated from the horizontal information by differentiating and integrating circuits.

fading and other variations; second, the receiver is operating at or near maximum ceptible to interference from pulse-type be reduced or eliminated from the sync cellation. An example, of the latter method is shown in Fig. 43. In this cir-In fringe areas, two conditions com-First, the incoming signal available at the antenna is weak and susceptible to noise generated by certain types of elecswitches, or the like. Some type of noise immunity provision is almost essential for acceptable performance. Noise may and age circuits by gating or by a combination of gating, inversion, and cancuit the 6GY6, which has two independent control grids, serves the dual funcplicate the process of sync separation. gain which makes it extremely sustrical equipment, ignition systems, tion of age amplifier and noise inverter.



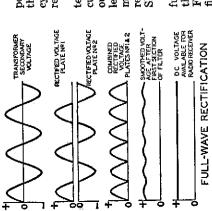
Because the sync tips of the video signal at grid No.1 of the 6GY6 drive the tube near its cutoff region, any noise signal extending above the tip level will appear inverted across the grid-No.2 load resistor R. This inverted noise signal is re-combined with the video signal and

fed to the sync separator at point "A" Fig. 43 where noise cancellation takes tion of the inverted noise signal is fed to the second control grid, grid No.3, of the 6GY6 to cut off or gate the AGC amplace. This process leaves the sync pulses relatively free of disturbing noise and results in a stable picture. To prevent reduction of receiver gain due to the effect of noise on the agc amplifier, a porplifier when a noise pulse occurs.

Rectification

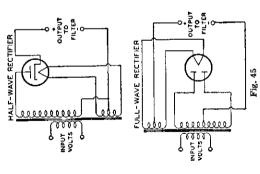
Diodes, in the ELECTRONS, ELECTRODES, AND ELECTRON TUBE ing a receiver with de power from an ac line and in supplying high de voltage cludes a rectifier tube, a filter, and a The rectifying action of a diode finds important applications in supplyfrom a high-voltage pulse. A typical arrangement for converting ac to dc involtage divider. The rectifying action of the tube is explained briefly under SECTION. High-voltage pulse rectification is described later under Horizontal Output Circuits.

out the ripple of the tube output, as infier efficiency. The action of the filter is dicated in Fig. 44 and to increase recti-The function of a filter is to smooth



STALLATION SECTION under Filters. The voltage divider is used to cut down the output voltage to the values required by the plates and the other explained in ELECTRON TUBE INelectrodes of the tubes in the receiver.

on one half-cycle when plate No. 1 is input voltage when the plate is positive wave circuit, current flows to the filter filter on every other half-cycle of the ac wave rectifier circuit are shown in Fig. flows through the rectifier tube to the with respect to the cathode. In the fullon every half-cycle, through plate No. 1 A half-wave rectifier and a full-In the half-wave circuit, current



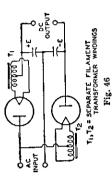
positive with respect to the cathode, and through plate No. 2 on the next halfcycle when plate No. 2 is positive with respect to the cathode.

cuit than in the half-wave circuit, the output of the full-wave circuit requires Because the current flow to the filless filtering. Rectifier operating information and circuits are given under each rectifier tube type and in the CIRCUIT ter is more uniform in the full-wave cir-SECTION, respectively.

handling capability of the complete recgether and each tube acts as a half-wave rectifier. The allowable voltage and load conditions per tube are the same as for tull-wave service but the total load-Parallel operation of rectifier tubes urnishes an output current greater than For example, when two full-wave rectifier tubes are connected in parallel, the plates of each tube are connected tothat obtainable with the use of one tube. tifier is approximately doubled.

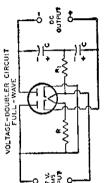
pe considerably unbalanced and larger nected in parallel, the corresponding filament leads should be similarly con-When mercury-vapor rectifier tubes sistor to be used will depend on the amount of plate current that passes through the rectifier. Low plate current requires a high value; high plate current, a low value. When the plates of mercury-vapor rectifier tubes are connected. Otherwise, the tube drops will are connected in parallel, a stabilizing resistor of 50 to 100 ohms should be connected in series with each plate lead in order that each tube will earry an equal share of the load. The value of the restabilizing resistors will be required.

Two or more vacuum rectifier tubes can also be connected in parallel to give correspondingly higher output current and, as a result of paralleling their internal resistances, give somewhat increased voltage output. With vacuum types, stabilizing resistors may or may not be necessary depending on the tube type and the circuit.



rives its name from the fact that its dc voltage output can be as high as twice the peak value of ac input. Basically, a voltage doubler is a rectifier circuit arranged so that the output voltages of A voltage-doubler circuit of simple form is shown in Fig. 46. The circuit detwo half-wave rectifiers are in series.

be described briefly as follows. On the The action of a voltage doubler can



R * HEATERS OF OTHER TUBES IN SERIES WITH VOLTAGE-DROPPING RESISTOR

capacitor. On the next half-cycle of the ac input, when the upper side of the line side, the lower diode passes current so that a negative voltage builds up across a positive voltage builds up across the side, the upper diode passes current and feeds a positive charge into the upper ates on the upper plate of the capacitor, is negative with respect to the lower positive half-cycle of the ac input, that is, when the upper side of the ac input ine is positive with respect to the lower capacitor. As positive charge accumuthe lower capacitor. Electron Tube Applications

rectifier passes current to the load on the ac input. It can be seen from the one capacitor and -E on the other, the Thus the voltage doubler supplies a nothe peak acinput voltage. When current oad, the output voltage drops below 2E nitude of the load current and the capacitance of the capacitors. The arrangewave voltage doubler because each So long as no current is drawn atage of magnitude E, the peak value of diagram that with a voltage of +E on total voltage across the capacitors is 2E. load de output voltage twice as large as is drawn at the output terminals by the by an amount that depends on the magment shown in Fig. 46 is called a fulleach capacitor can charge up to a voltthe output terminals from the capacitor, each half of the ac input cycle.

signed for use as voltage doublers are the 25Z6GT and 117Z6GT. These tubes combine two separate diodes in one tube. As voltage doublers, the tubes are these receivers, the heaters of all tubes in the set are connected in series with a The connections for the heater supply and the voltage-doubling circuit are used in "transformerless" receivers. In voltage-dropping resistor across the line. Two rectifier types especially deshown in Fig. 47.

VOLTAGE - DOUBLER CIRCUIT

RIPROTECTIVE RESISTOR

Fig. 47

the de load circuit can not be connected to ground or to one side of the ac supply circuit in Fig. 47, it will be noted that line. This circuit presents certain disadvantages when the heaters of all the With the full-wave voltage-doubler

UNMODULATED RF CARRIER



AF MODULATING WAVE

Fig. 48

ation

tubes in the set are connected in series a circuit arrangement may cause hum with a resistance across the ac line. Such because of the high ac potential between the heaters and cathodes of the tubes.

poorer than that of the full-wave voltage charges in series with the line voltage cuit in Fig. 47 overcomes this difficulty by making one side of the ac line common with the negative side of the dc which, on the following half cycle, disthrough the other half of the tube. This circuit is called a half-wave voltage acubler because rectified current flows tion of this arrangement is somewhat The half-wave voltage-doubler ciroad circuit. In this circuit, one half of the tube is used to charge a capacitor to the load only on alternate halves of the ac input cycle. The voltage regula-

Detection

a radio-frequency (rf) wave which is of either of two general types. In one type, the wave is said to be amplitude modustant and the amplitude is varied. In the other type, the wave is said to be frequency modulated when its amplitude When speech, music, or video information is transmitted from a radio or television station, the station radiates ated when its frequency remains conremains essentially constant but its frequency is varied.

The function of the receiver is to reproduce the original modulating wave from the modulated rf wave. The receiver stage in which this function is performed is called the demodulator or detector

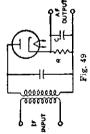
AM Detection

ent basic circuits used for the detection shown in Fig. 48. There are three differtion on the waveform of the rf wave is The effect of amplitude modulaof amplitude-modulated waves: the di-

PLITUDE -MODULATED RF WAVE

cycles of the rf wave. With alternate of the other half-cycles can be amplified are alike in that they eliminate, either partially or completely, alternate halfhalf-cycles removed, the audio variations the grid-resistor detector. These circuits ode detector, the grid-bias detector, and to drive headphones or a loudspeaker.

A diode-detector circuit is shown in Fig. 49. The action of this circuit



when a modulated rf wave is applied is illustrated by Fig. 50. The rf voltage applied to the circuit is shown in light line; the output voltage across capacitor C is shown in heavy line.



voltage, capacitor C charges up to the peak value of the rf voltage. Then as the ode at a potential more positive than the Between points (a) and (b) on the first positive half-cycle of the applied rf applied rf voltage falls away from its peak value, the capacitor holds the cathvoltage applied to the anode. The capaci-

= Electron Tube Applications tor thus temporarily cuts off current from (b) to (c) through the diode load through the diode. While the diode current is cut off, the capacitor discharges resistor R.

When the rf voltage on the anode tor charges up to the peak value of the second positive half-cycle at (d). In this follows the peak value of the applied rf at which the capacitor holds the cathway, the voltage across the capacitor voltage and reproduces the af modurises high enough to exceed the potential ode, current flows again and the capaci-

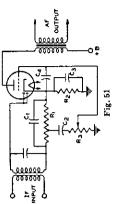
the capacitor is negligible. Hence, when duces the speech or music originating at The curve for voltage across the which represents an rf component in the ated in the drawing. In an actual circuit the rf component of the voltage across capacitor, as drawn in Fig. 50, is somevoltage across the capacitor is exaggerthe voltage across the capacitor is amplified, the output of the amplifier reprowhat jagged. However, this jaggedness, the transmitting station.

circuit as a half-wave rectifier. When the rf signal on the plate swings positive, the flows through the load resistance R. Because the dc output voltage of a rectifier depends on the voltage of the ac input, the de voltage across C varies in accordance with the amplitude of the rf carrier and thus reproduces the af signal. Capacitor C should be large enough to smooth out rf or if variations but should not be so large as to affect the audio variations. Two diodes can be connected in a circuit similar to a full-wave rectifier to give full-wave detection. However, in practice, the advantages of this connection generally do not justify the extra Another way to describe the action of a diode detector is to consider the tube conducts and the rectified current circuit complication.

circuit. However, because the diode iore reduces the selectivity of the input amplify the signal, and that it draws current from the input circuit and there-The diode method of detection produces less distortion than other methods because the dynamic characteristics of a diode can be made more linear than those of other detectors. The disadvantages of a diode are that it does not

tortion and because it permits the use of simple ave circuits without the necesthe diode method of detection is most method of detection produces less dissity for an additional voltage supply, widely used in broadcast receivers.

A typical diode-detector circuit using R, is the diode load resistor. A portion of the af voltage developed across this resistor is applied to the triode grid through the volume control Rs. In a typical circuit, resistor R, may be tapped a twin-diode triode tube is shown in Fig. Both diodes are connected together.

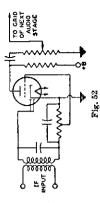


so that five-sixths of the total af voltage across R₁ is applied to the volume control. This tapped connection reduces the af voltage output of the detector circuit slightly but it reduces audio distortion

and improves the rf filtering.

and the audio bypass capacitor C3. The function of capacitor C, is to bypass and rf voltage on the grid to cathode. A this circuit. With a pentode, the af out-DC bias for the triode section is provided by the cathode-bias resistor R₂ unction of capacitor C₂ is to block the de bias of the cathode from the grid. The twin-diode pentode may also be used in put should be resistance-coupled rather than transformer-coupled.

Another diode-detector circuit, called a diode-biased circuit, is shown in Fig. 52. In this circuit, the triode grid is



load resistor. When an rf signal voltage is applied to the diode, the dc voltage at connected directly to a tap on the diode

tor between the grid and the diode load The advantage of the circuit shown biased circuit does not employ a capaciresistor, and consequently does not produce as much distortion of a signal havin Fig. 52 over the self-biased arrangement shown in Fig. 51 is that the diodeing a high percentage of modulation.

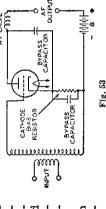
pends on the average amplitude of the age amplitude of the voltage applied to rf voltage applied to the diode, the aver-Otherwise there will be different values of bias on the triode grid for different duce distortion. Because there is no bias applied to the diode-biased triode when in the plate circuit of the triode to limit values of signal strength at the antenna. signal strengths and the triode will pro-However, there are restrictions on the use of the diode-biased circuit. Because the bias voltage on the triode dethe diode should be constant for all no rf voltage is applied to the diode, sufficient resistance should be included its zero-bias plate current to a safe value.

system. With such an ave system, the average amplitude of the signal voltage channel automatic-volume-control (avc) These restrictions mean, in practice, that the receiver should have a separate applied to the diode can be held within very close limits for all values of signal strength at the antenna.

airly large value of bias voltage. The cuit should be one which operates at a taking a fairly large bias voltage are The tube used in a diode-biased cirvariations in bias voltage are then a small percentage of the total bias and hence produce small distortion. Tubes types such as the 6BF6 or 6SR7 having a medium-mu triode. Tube types having a high-mu triode or a pentode should not be used in a diode-biased circuit.

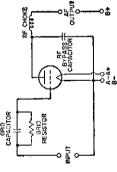
A grid-bias detector circuit is shown in Fig. 53. In this circuit, the grid is biased almost to cutoff, i.e., operated so that the plate current with zero signal the high negative bias, only the positive is practically zero. The bias voltage can a C-battery, or a bleeder tap. Because of half-cycles of the rf signal are amplified be obtained from a cathode-bias resistor,

tages of this method of detection are tected in the plate circuit. The advanthat it amplifies the signal, besides detecting it, and that it does not draw by the tube. The signal is, therefore, de-



fore does not lower the selectivity of the current from the input circuit and thereinput circuit.

method, illustrated by Fig. 54, is somewhat more sensitive than the grid-bias method and gives its best results on grid. Hence, on the positive half-cycles weak signals. In this circuit, there is no negative de bias voltage applied to the of the rf signal, current flows from grid to cathode. The grid and cathode thus act as a diode detector, with the grid The voltage across the capacitor then reproduces the af modulation in the the diode detector. This voltage appears The grid - resistor - and - capacitor resistor as the diode load resistor and the same manner as has been explained for between the grid and cathode and is therefore amplified in the plate circuit. grid capacitor as the rf bypass capacitor.



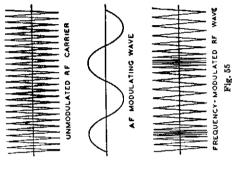
The output voltage thus reproduces the original af signal.

resistance. This detector circuit ampli-In this detector circuit, the use of a high-resistance grid resistor increases tained with lower values of grid-circuit selectivity and sensitivity. However, improved af response and stability are ob-AF CHOKE Fig. 54

the input circuit and therefore lowers the selectivity of the input circuit.

FM Detection

The effect of frequency modulation on the waveform of the rf wave is shown in Fig. 55. In this type of transmission,

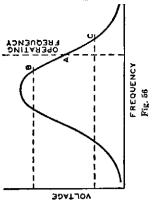


the frequency of the rf wave deviates and is proportional to the amplitude of from a mean value, at an rf rate dependthat is determined in the transmitter ing on the modulation, by an amount the af modulation signal.

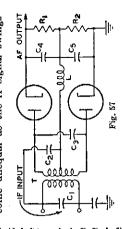
For this type of modulation, a detween deviations above and below the mean frequency and to translate those deviations into a voltage whose amplitude varies at audio frequencies. Since the deviations occur at an audio frequency, the process is one of demodulation determines the amplitude of the tector is required to discriminate betion, and the degree of frequency deviademodulated (af) voltage.

restricted to the portion of the slope the voltage developed across the circuit this circuit, the frequency swing must be which is effectively straight. Since this tions is a circuit which is tuned so that the mean radio frequency is on one slope of Fig. 56. With modulation, the frequency swings between B and C, and varies at the modulating rate. In order that no distortion will be introduced in A simple circuit for converting frequency variations to amplitude variaof its resonance characteristic, as at A

veloped is low. Because of these limitations, this circuit is not commonly used portion is very short, the voltage debut it serves to illustrate the principle.



with the primary through capacitor C1), the rf voltages applied to the diodes be-The faults of the simple circuit are sometimes called a discriminator circuit, such as that shown in Fig. 57. Because of the phase relationships between the primary and each half of the secondary of the input transformer (each half of the secondary is connected in series come unequal as the rf signal swings overcome in a push-pull arrangement,



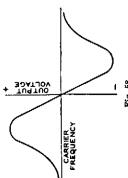
rom the resonant frequency in each direction.

output voltage depends on the difference in amplitude of the voltages developed across R, and R2. These voltages are equal and of opposite sign when the rf carrier is not modulated and the output is, therefore, zero. When modulation is applied, the output voltage varies as ation), the voltage developed across the diode load resistors, R, and R, connected in series, varies at audio frequencies. The requencies (determined by the af modu-Since the swing occurs at indicated in Fig. 58.

sensitive to amplitude variations in the Because this type of FM detector is rf carrier, a limiter stage is frequently

fies the signal, but draws current from

Electron Tube Applications

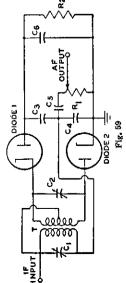


detector. This FM detector, unlike the in the ratio of the voltage across two diodes and is, therefore, insensitive to quency-modulated waves is called a ratio previous one which responds to a difference in voltage, responds only to changes changes in the differences in the voltages due to amplitude modulation of the rf Another form of detector for fre-

Fig. 59. The plate load for the final if

be reproduced Fig. 58

The basic ratio detector is given in amplifier stage is the parallel resonant



circuit consisting of C1 and the primary transformer T. The tuning and coupling of the transformer is practically the therefore, the rf voltages applied to the same as in the previous circuit and quency in each direction. At this point diodes depend upon how much the rf signal swings from the resonant frethe similarity ends.

Diode 1, R2, and diode 2 complete a series circuit fed by the secondary of the transformer T. The two diodes are connected in series so that they conduct on tent through R2 causes a negative voltthe same rf half-cycle. The rectified cur-Because C₆ is large, this negative voltage at the plate of diode 1 remains constant age to appear at the plate of diode 1.

cuit regulates the receiver rf and if gain

the antenna is fading in and out.

so that this gain is less for a strong signal than for a weak signal. In this way, when the signal strength at the antenna

changes, the ave circuit reduces the resultant change in the voltage output of the last if stage and consequently re-

duces the change in the speaker output

volume.

even at the lowest audio frequencies to

The rectified voltage across C₁ is proportional to the voltage across diode Since the voltages across the two diodes differ according to the instantaneous frequency of the carrier, the proportional to the voltage across diode and the rectified voltage across C, is voltages across C₃ and C₄ differ proportionately, the voltage across C₃ being the larger of the two voltages at carrier requencies below the intermediate frequency and the smaller at frequencies above the intermediate frequency.

These voltages across C, and C, are additive and their sum is fixed by the while the ratio of these voltages varies at an audio rate, their sum is always constant. The voltage across C, varies modulated rf carrier is applied to the ratio detector; this audio voltage is ex-For a complete circuit utilizing this type of detector, refer to the CIRCUIT constant voltage across Co. Therefore, at an audio rate when a frequencytracted and fed to the audio amplifier. SECTION.

filter R2 and C, as negative bias on the grids of the preceding stages. When the the last if stage as it would produce the flow of diode current through R1, there is a voltage drop across live with respect to ground. This voltage therefore, the signal applied to the ave diode increases, the voltage drop across R, increases, the negative bias voltage creased. Thus the increase in signal strength at the antenna does not produce as much increase in the output of \Re , which makes the left end of \Re 1 negadrop across R, is applied, through the signal strength at the antenna increases, applied to the rf and if stages increases, and the gain of the rf and if stages is dewithout ave. Because of

crease in the signal output of the last put of the last if stage, and thus acts to When the signal strength at the value, the ave circuit acts, of course, in the reverse direction, applying less negative bias, permitting the rf and if gain if stage. In this way, when the signal strength at the antenna changes, the ave circuit acts to reduce change in the outantenna decreases from a previous steady to increase, and thus reducing the dereduce change in loudspeaker volume.

> Automatic Volume or Gain Control The chief purposes of automatic volume control (avc) or automatic gain

(age) in a radio or television receiver are to prevent fluctuations in loudspeaker volume or picture brightness when the audio or video signal at An automatic volume control cir-

control

variations in ave voltage would vary the The filter, C and R2, prevents the ave voltage from varying at audio frequency. The filter is necessary because the voltage drop across R. varies with from R. without filtering, the audio receiver gain so as to smooth out the modulation of the carrier. To avoid this the modulation of the carrier being received. If ave voltage were taken directly

most fading. Thus the filter permits the capacitor C. Because of the resistance R2 in series with C, the capacitor C can as the audio range but can vary at freeffect, the ave voltage is taken from the charge and discharge at only a comparatively slow rate. The ave voltage therefore cannot vary at frequencies as high quencies high enough to compensate for ave circuit to smooth out variations in signal due to fading, but prevents the circuit from smoothing out audio moduation. The ave circuit reduces the rf and if signal increases. A simple ave circuit is cycle of the signal voltage, when the

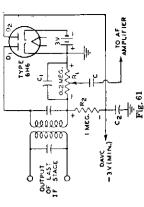
and frequency-mixer stages when the shown in Fig. 60. On each positive halfdiode plate is positive with respect to the cathode, the diode passes current.

gain for a strong signal usually by increasing the negative bias of the rf, if It will be seen that an ave circuit and a diode-detector circuit are much alike. It is therefore convenient in a receiver to combine the detector and the ave diode in a single stage. Examples of how these functions are combined in receivers are shown in CIRCUIT SECTION.

₩ Fig. 60

In the circuit shown in Fig. 60, a certain amount of ave negative bias is weak signal. Since it may be desirable some cases to apply no ave bias until the applied to the preceding stages on a to maintain the receiver rf and if gain at the maximum possible value for a weak signal, ave circuits are designed in signal strength exceeds a certain value. These ave circuits are known as delayed In the circuit shown in Fig. ave or dave circuits.

A dave circuit is shown in Fig. 61. In this circuit, the diode section D₁ of the 6H6 acts as detector and ave diode.



C, are the ave filter. Because the cathode of diode D, is returned through a fixed supply of -3 volts to the cathode of D, a de current flows through R. and R. in series with D₂. The voltage drop caused by this current places the ave lead at approximately -3 volts (less the negligible drop through D₂). When the average R_1 is the diode load resistor and R_2 and

amplitude of the rectified signal develcontrolled tubes stays constant at a oped across R. does not exceed 3 volts, the ave lead remains at -3 volts. Hence, for signals not strong enough to develop 3 volts across R., the bias applied to the value giving high sensitivity.

strong signals, but permits the gain to an increasing ave bias voltage to the stay constant at a maximum value for However, when the average amplicomes more negative than the cathode trolled by the voltage developed across R. Therefore, with further increase in signal strength, the ave circuit applies controlled stages. In this way, the circuit regulates the receiver gain for tude of rectified signal voltage across R₁ exceeds 3 volts, the plate of diode D_2 beof D, and current flow in diode D, ceases. The potential of the avc lead is then con-

tion of the -3 volts delay voltage is volts. Hence, with the circuit constants tection because it is not large enough to applied to the plate of the detector diode D, this portion being approximately equal to $R_1/(R_1 + R_2)$ times -3 as shown, the detector plate is made negative with respect to its cathode by this voltage does not interfere with de-It can be seen in Fig. 61 that a porapproximately one-half volt. However, prevent current flow in the tube.

sync pulses at the output of the video Automatic gain control (agc) comcarrier amplitude. The peak carrier level rather than the average carrier level is controlled by the agc voltage because by measurement of the peaks of the pensates for fluctuations in rf picture the peaks of the sync pulses are fixed The peak carrier level may be determined when inserted on a fixed carrier level.

A conventional age circuit, such as that shown in Fig. 62, consists of a diode

detector circuit and an RC filter. The time constant of the detector circuit is made large enough to prevent the pic-

voltage (age voltage) is equal to the nitude of the agc voltage. The output ture content from influencing the magpeak value of the incoming signal.

and thence into capacitor C1, where the negative charge is stored. Because of the ing conduction, C. charges up to the pacitor C₁. The resistor R₁ provides the oad for the diode. The diode conducts only when its plate is driven positive with respect to its cathode. Electrons then flow from the eathode to the plate The diode detector receives the incoming signal from the last if stage of ow impedance offered by the diode durthe television receiver through the cavalue of the peak applied voltage.

During succeeding positive cycles, the ative charge stored in C. before the diode at the peak of each positive cycle. The mined by the level of the peaks of the During the negative excursion of R,C,, however, only a small percentage of the voltage across C1 is lost during the conducts, and plate current flows only voltage across C1, therefore, is deterthe signal, the diode does not conduct, and C, discharges through resistor R. Because of the large time constant of interval between horizontal sync pulses. incoming signal must overcome the negpositive cycles, or the sync pulses.

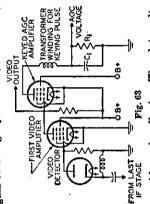
weak signals.

horizontal sync pulse. The dc output is The negative voltage developed across resistor R. by the sync pulses is filtered by resistor R2 and capacitor C2 to remove the 15,750-cycle ripple of the then fed to the if and rf amplifiers as an age voltage.

or amplification of the de signal. The before detection of the peak level, or This age system may be expanded A direct-coupled amplifier must be used addition of amplification makes the system more sensitive to changes in carrier to include amplification of the age signal amplification of the dc output, or both. level.

A "keyed" age system such as that shown in Fig. 63 is used to eliminate flutter and to improve noise immunity in weak signal areas. This system provides more rapid action than the conventional age circuits because the filter circuit can employ lower capacitance and resistance In the keyed agc system, the nega-

tive output of the video detector is fed directly to the grid No.1 of the first video amplifier. The positive output of the video amplifier is, in turn, fed directly to the grid No.1 of the keyed age amplifier. The video stage increases the gain of the age system and, in addition,



obtained from the video amplifier. The polarity of this pulse is such that the plate of the age amplifier tube is positive during the retrace time. The tube is potential during the pulse. These pulses the plate circuit (R,C1). Because the dc age for the age amplifier is a positive is in phase with the horizontal sync pulse biased so that current flows only when are smoothed out in the RC network in provides noise clipping. The plate voltpulse obtained from a small winding on the horizontal output transformer which the grid No.1 and the plate are driven positive simultaneously. The amount of current flow depends on the grid-No.1 voltage developed across R_i is negative, it is suitable for application to the grids of the rf and if tubes as an agc voltage.

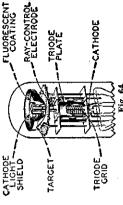
Tuning Indication With Electron-Ray Tubes

Electron-ray tubes are designed to parts: (1) a triode which operates as a dc controlling voltage. One application of them is as tuning indicators in radio amplifier and (2) an electron-ray inditracts electrons from the cathode. When cent target the effects of a change in receivers. Types such as the 6U5, 6E5, and the 6AB5/6N5 contain two main cator which is located in the bulb as shown in Fig. 64. The target is operated the electrons strike the target they produce a glow on the fluorescent coating of the target. Under these conditions, indicate visually by means of a fluoresat a positive voltage and, therefore, at-

the target appears as a ring of light.

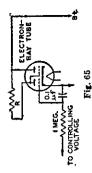
Electron Tube Applications

between the cathode and target. When tive than the target, electrons flowing to the potential of this electrode is less posithe target are repelled by the electro-A ray-control electrode is mounted static field of the electrode, and do not



the electrode. Because the target does electrode is at approximately the same not glow where it is shielded from electrons, the control electrode casts a mately 100° of the target when the control electrode is much more negative shadow on the glowing target. The extent of this shadow varies from approxthan the target to 0° when the control reach that portion of the target behind potential as the target.

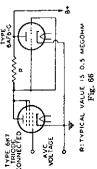
electrode is determined by the voltage on the grid of the triode section, as can be seen in Fig. 65. The flow of the triode ray tube, the potential of the control plate current through resistor R produces In the application of the electron-



creases, the potential of the control elecdrop across R, and the shadow angle widens. When the potential of the triode a voltage drop which determines the pocential of the control electrode. When the voltage of the triode grid changes in the positive direction, plate current introde goes down because of the increased grid changes in the negative direction, the shadow angle narrows.

Another type of indicator tube is the 6AF6G. This tube contains only an indicator unit but employs two ray-con-

trol electrodes mounted on opposite sides of the cathode and connected to individual base pins. It employs an external dc amplifier. (See Fig. 66.) Thus, two symmetrically opposite shadow angles



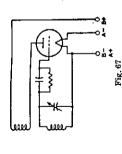
may be obtained by connecting the two ray-control electrodes together; or, two unlike patterns may be obtained by individual connection of each ray-control electrode to its respective amplifier.

In radio receivers, ave voltage is applied to the grid of the dc amplifier. Because ave voltage is at maximum when the set is tuned to give maximum response to a station, the shadow angle is at minimum when the receiver is tuned to resonance with the desired station.

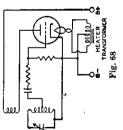
The choice between electron-ray tubes depends on the ave characteristic of the receiver. The 6E5 contains a sharp-cutoff triode which closes the shadow angle on a comparatively low value of ave voltage. The 6AB5/6N5 and 6U5 each have a remote-cutoff triode which closes the shadow on a larger value of ave voltage than the 6E5. The 6AF6G may be used in conjunction with dc amplifier tubes having either remote- or sharp-cutoff characteristics.

Oscillation

As an oscillator, an electron tube neterodyne receivers for supplying the (represented in Figs. 67 and 68) may be utilized, but they all depend on feeding grid circuit than is required to equal the sate for the loss in the grid circuit, the can be employed to generate a continuously alternating voltage. In presentday radio broadcast receivers, this application is limited practically to superheterodyning frequency. Several circuits more energy from the plate circuit to the power loss in the grid circuit. Feedback may be produced by electrostatic or electromagnetic coupling between the grid and plate circuits. When sufficient energy is fed back to more than compen-



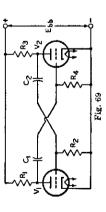
tube will oscillate. The action consists of regular surges of power between the plate and the grid circuit at a frequency dependent on the circuit constants of inductance and capacitance. By proper choice of these values, the frequency may be adjusted over a very wide range.



Multivibrators

Relaxation oscillators, which are widely used in present-day electronic equipment, are used to produce nonsinusoidal waveshapes such as rectangular and sawtooth pulses. Probably the most common relaxation oscillator is the multivibrator, which may be considered as a two-stage resistance-coupled amplifier in which the output of each tube is coupled into the input of the other tube.

Fig. 69 is a basic multivibrator circuit of the free-running type. In this circuit, oscillations are maintained by the



alternate shifting of conduction from one tube to the other. The cycle usually starts with one tube, V₁, at zero bias, and the other, V₂, at cutoff or beyond. At this point, the capacitor C₁ is charged

sufficiently to cut off V₂. C, then begins to discharge through the resistor R₄, and the voltage on the grid of V₂ rises until V₃ begins to conduct. The voltage on the plate of V₃ then decreases, causing V₃ to conduct less and less. At the same time, the plate voltage of V₁ begins to rise, causing V₂ to conduct still more heavily. Because of the amplification, this cumulative effect builds up extremely fast, and conduction switches from V₁ to V₂ within a few microseconds, depending on the circuit components.

In this circuit, therefore, conduction switches from V₁ to V₂ over the interval during which C₁ discharges from the voltage across R₄ to the cutoff voltage for V₂. The actual transfer of conduction does not occur until cutoff is reached. Conduction switches back to V₁ through a similar process to complete the cycle. The plate waveform is essentially rectangular in shape, and may be adjusted as to symmetry frequency, and amplitude by proper choice of circuit constants, tubes, and voltages.

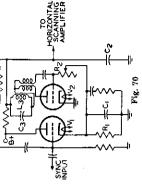
Although this type of multivibrator is free-running, it may be triggered by pulses of a given amplitude and frequency put. Butivibrator circuits may also be designed so that they are not free-running, but must be triggered externally to shift conduction from one tube to the other. Depending on the type of circuit, conduction may shift back to the first tube after a given time interval, or the second tube may continue conducting until another trigger signal is applied.

Synchroguide Circuits

The "synchroguide" is a controlled type of oscillator used in television receivers to generate and control the synchronized sawtooth voltage necessary for adequate line or horizontal-frequency scanning. A simplified synchroguide circuit is shown in Fig. 70. This circuit provides stable, noise-free control of a blocking oscillator which generates a horizontal-frequency signal. It permits comparison of the received sync pulses and the generated sawtooth voltages so that properly locked-in horizontal scanning results.

The triode \mathbf{V}_i in Fig. 70 is a conventional blocking oscillator which enables

a sawtooth voltage to be developed across the capacitor C₂. A portion of this sawtooth is fed back to the grid of the control tube, V₁. The positive sync pulses



are also applied to the grid of V₁. The waveforms shown in Fig. 71 illustrate the sawtooth and sync pulses (A and B) and their proper "fin-sync" combination (C). The sync pulse occurs partly during the portion of the sawtooth voltage in which the triode V₁ draws current. Any shift in sync pulse as it is superimposed

CUTOFF
CU

on the sawtooth, therefore, will affect the amount of conduction of the control tube. A change in control-tube conduction ultimately affects the bias on the oscillator-tube grid by changing the voltage to which the capacitor C, in the reathode circuit may charge. An increase in the positive bias increases the frequency of oscillation.

quency or oscillation.

To illustrates a condition in which the sawtooth voltage is advanced in phase with respect to the sync-pulses. The widening of the pulse which occurs at the corner of the sawtooth waveform allows the control tube to conduct more current and, consequently, allows the capacitor C₁ to charge to a higher voltage. This increased reference voltage also appears in the grid circuit of V₂ and makes the grid more positive. The increased grid voltage then speeds up the frequency of oscillations until proper synchronization results.

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The blocking oscillator can be made more immune to changes in frequency and noise if V_1 is brought out of cutoff very sharply. This effect is obtained by sine-wave stabilization. The tuned circuit L₅-C₅ in the plate circuit of Fig. 70 superimposes a shock-excited sine wave on the plate and grid waveforms, as shown in Fig. 72.

GRID CUTOFF
GRADUAL APPROACH;
TUBE CAN BE DRIVEN
A SLIGHT OF THE CHOOF BY
ARIATIONS.

SHARPER APPROACH MARKES OSCILLATOR SUSCEPTIBLE FRANCES. Fig. 72

Deflection Circuits Vertical Output Circuits

A modified multivibrator in which the vertical output tube is part of the oscillator circuit is used in the vertical deflection stage of many television receivers. This stage supplies the deflection energy required for vertical deflection of the picture-tube beam. A simplified combined vertical-oscillator-output stage is shown in Fig. 73. Waveshapes at critical points of the circuit are included

the inductive components in the yoke and transformer. The effect of these inductive components must be taken into consideration, however, particularly during retrace. The fast rate of current change during retrace time (which is approximately 1/15 as long as trace time) causes a high-voltage pulse at the plate which could give a trapezoidal waveshape to the plate voltage and cause increased plate current, excess damping, and lengthened retrace time. However, the grid voltage is made sufficiently negative during retrace to keep the tube close to cutoff, as described below. The frequency and the relative deve.

ately rises to the voltage across C₁. The values of resistors R, and R, and the RC the grid of V2 is created by capacitor C1 does not discharge completely when Vi resulting waveshape is shown in Fig. The frequency, and the relative detions of each cycle, are dependent on the combination R₃C₂, as explained previ-The desired trapezoidal waveshape at and resistor R2. If R2 were equal to zero, C₁ would cause the grid-voltage wave-74(a). When R_2 is sufficiently large, C_1 conducts. When V, is cut off, therefore, the voltage on the grid of \mathbf{V}_2 immediviation of the positive and negative porously in the section on multivibrators. shape to take the form shown in Fig.

HOLD STATE S

to illustrate the development of the desired current through the vertical output transformer and deflecting yoke.

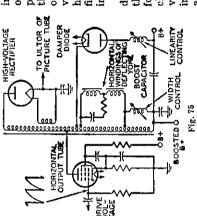
The current waveform through the deflecting yoke and output transformer should be a sawtooth to provide the desired deflection. The grid and plate voltage waveforms of the output tube could also be sawtooth except for the effect of

74(b). The negative-going pulse of the grid-voltage waveshape prevents the high plate pulse from causing excess conduction, and thereby prevents overdamping.

This vertical deflection stage utilizes twin-triode tubes such as the 6DR7 and 6EM7. The 6EM7 is particularly suitable for this application because it incorporates dissimilar units to provide for the different operating requirements of the oscillator and output sections.

Horizontal Output Circuits

Fig. 75 shows a typical horizontaloutput-and-deflection circuit used in television receivers. In addition to supplying the deflection energy required for horizontal deflection of the picture-tube beam, this circuit provides the high dc



voltage required for the ultor of the picture tube and the "boosted" B voltage for other portions of the receiver. The horizontal-output tube is usually a beam power tube such as the 6DQ6B, 6CD6-GA, or 6GW6.

In this circuit, a sawtooth voltage seconds, the sawtooth voltage on the plied to the grid No.1 of the horizontaloutput tube. When this voltage rises transformer to the horizontal-deflecting This sudden change sets up an oscillation from the horizontal-oscillator tube is apabove the cutoff point of the output tube, the tube conducts a sawtooth of plate current which is fed through the autoyoke. At the end of the horizontal-scanning cycle, which lasts for 63.4 microgrid suddenly cuts off the output tube. of about 50 to 70 Kc in the output circuit, which may be considered as an inductor shunted by the stray capacitance of the circuit. During the first half of this oscillation, a positive voltage appears across the transformer. In the sec-

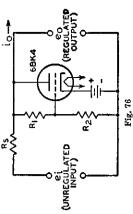
ond half of the cycle, the voltage swings below the plate supply voltage, and the damper diode conducts, damping out the oscillation. At the same time, the current through the deflecting yoke reverses and reaches its negative peak. As the damperdiode current decays exponentially to zero, the output tube begins to conduct again. The yoke current, therefore, is composed of current resulting from damper-diode conduction followed by output-tube conduction.

When the output tube is suddenly cut off, the high-voltage pulse produced by shock excitation of the load circuit is increased by means of an extra winding on the transformer. This high-voltage pulse charges a high-voltage capacitor through the high-voltage rectifier. The output of this circuit is the dc high-voltage supply for the picture tube. The high-voltage rectifier also obtains its filament power through a separate winding on the horizontal-output transformer.

Current flowing through the damper diode charges the "boost" capacitor through the damper portion of the transformer winding. The polarity of the voltage at the low end of the winding is increased above the plate supply voltage, or B+. This higher voltage or "boost" is used for the output-tube plate supply, and may also supply the deflection oscillators and the vertical output circuit provided the current drain is not excessive.

High-Voltage Regulator Circuit

In color-television receivers, it is very important to regulate the high-voltage supply to the picture tube. A suitable circuit using the 6BK4 for regulation of



the output of a high-voltage, high-impedance supply is shown in Fig. 76. In this

drawn.

R_s, which tends to counteract the original rise of the voltage. If desired, the grid may be connected to a variable point on the voltage divider to allow some adjustment of the output-voltage R, and R. This increased grid voltage The increased current, in turn, causes When the output voltage, eo, rises as a result of a decrease in load current, a small fraction of the additional voltage is applied to the grid of the tube by the voltage-divider circuit consisting of causes the tube to draw an increased current from the unregulated supply. a voltage drop across the high internal impedance of the unregulated supply, level.

also be obtained from a tap on the B-boost voltage supply. The use of this rangement, variations in high voltage age at the regulator grid, and the resultlator increase or decrease the loading of the high-voltage supply so that the total lower voltage (about 375 volts) elimisome high-voltage resistors. In this aralso vary the tapped-down B-boost volting variations in conduction of the regu-The grid voltage for the 6BK4 can nates the need for costly and troubleload remains nearly constant.

Frequency Conversion

quency, the rf signal voltage and the superheterodyne receivers to change the mediate frequency. To perform this and a frequency mixer is employed. In such a device, shown diagrammatically voltage generated by the oscillator, are Frequency conversion is used in frequency of the rf signal to an interchange in frequency, a frequency-converting device consisting of an oscillator in Fig. 77, two voltages of different fre-

INTERMEDIATE FREQUENCY OUTPUT FREQUENCY CONVERTER FREQUENCY OSCILLATOR Fig. 77

a plate current having, in addition to the applied to the input of the frequency dyne, within the mixer tube to produce frequencies of the input voltages, numermixer. These voltages beat, or heteroous sum and difference frequencies.

quency and the oscillator frequency. The the intermediate frequency, or if. The output frequency of the mixer tube is quency by tuning the oscillator to the The output circuit of the mixer stage is provided with a tuned circuit which is adjusted to select only one beat frequency, i.e., the frequency equal to the difference between the signal freselected output frequency is known as kept constant for all values of signal freproper frequency.

Important advantages gained in a are high selectivity with few tuning receiver by the conversion of signal frequency to a fixed intermediate frequency stages and a high, as well as stable, overall gain for the receiver.

quency. The methods differ in the types are of interest. These methods are alike duce across the tuned plate load a voltof tubes employed and in the means of supply input voltages to the mixer tube. in that they employ a frequency-mixer frequency and the oscillator frequency. These variations in plate current proage of the desired intermediate fretube in which plate current is varied at a combination frequency of the signal Several methods of frequency conversion for superheterodyne receivers

A method widely used before the ploys as mixer tube either a triode, a betrode, or a pentode, in which oscillator the same grid. In this method, coupling is obtained by means of inductance or for frequency-conversion service and currently used in many FM, television, voltage and signal voltage are applied to between the oscillator and mixer circuits availability of tubes especially designed and standard broadcast receivers, emcapacitance.

A second method employs a tube having an oscillator and frequency mixer combined in the same envelope. In one orm of such a tube, coupling between the two units is obtained by means of Because five grids are used, the tube is the electron stream within the tube. called a pentagrid converter.

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ode are connected to an external circuit 2 is the anode. These and the cathode ode which supplies to the rest of the Grids No. 1 and No. 2 and the cathtube an electron stream that varies at to act as a triode oscillator. Grid No. 1 can be considered as a composite cathis the grid of the oscillator and grid No. the oscillator frequency.

ther controlled by the ri signal voltage on grid No. 4. Thus, the variations in the tube, is to accelerate the electron stream and to shield grid No. 4 electro-This varying electron stream is furplate current are due to the combination of the oscillator and the signal frequencies. The purpose of grids No. 3 and No. 5, which are connected together within statically from the other electrodes.

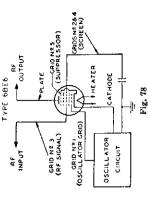
Pentagrid-converter tubes of this design are good frequency-converting oscillator and signal sections of the tube devices at medium frequencies. However, their performance is better at the lower frequencies because the output of the oscillator drops off as the frequency is raised and because certain undesirable effects produced by interaction between increase with frequency.

of the pentagrid-converter tubes are designed so that no electrode functions tubes, grid No. 1 functions as the oscillator grid, and grid No. 2 is connected within the tube to the screen grid (grid No. 4). The combined two grids, Nos. 2 and act as the composite anode of the oscillator triode. Grid No. 5 acts as the To minimize these effects, several alone as the oscillator anode. In these and 4, shield the signal grid (grid No. 3) suppressor grid.

signed so that the space charge around the cathode is unaffected by electrons from the signal grid. Furthermore, the electrostatic field of the signal grid also has little effect on the space charge. The grid produces little effect on the cathode Converter tubes of this type are deresult is that rf voltage on the signal changes in ave bias produce little change in oscillator transconductance or in the current. There is, therefore, little detuning of the oscillator by ave bias because input capacitance of grid No. 1.

Examples of the pentagrid converters discussed in the preceding paragraph are the single-ended types 1R5 and

6BE6. A schematic diagram illustrating is given in Fig. 78; the 6BE6 may also the use of the 6BE6 with self-excitation



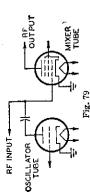
be used with separate excitation. A complete circuit is shown in the CIRCUIT SECTION.

of a mixer hexode. The cathode, triode grids Nos. 2 and 4), hexode signal grid act as a suppressor grid for the hexode Another method of frequency congrid, and triode plate form the oscillator unit of the tube. The cathode, hexode mixer grid (grid No. 1)hexodescreen grids grid No. 3), and hexode plate constitute the mixer unit. The internal shields are connected to the shell of the tube and version utilizes a separate oscillator having its grid connected to the No. 1 grid

triode unit, (2) the transferring of this frequency to the hexode grid No. 1, and (3) the mixing in the hexode unit of this The action of this tube in convertmediate frequency depends on (1) the generation of a local frequency by the frequency with that of the rf signal applied to the hexode grid No. 3. The tube plate voltage or signal-grid bias and, therefore, finds important use in allwave receivers to minimize frequencying a radio-frequency signal to an interis not critical to changes in oscillatorshift effects at the higher frequencies.

ent control grids and is used with a separate oscillator tube. RF signal voltand oscillator voltage is applied to the other. It follows, therefore, that the variations in plate current are due to A further method of frequency congrid mixer. This type has two independage is applied to one of the control grids the combination of the oscillator and version employs a tube called a pentasignal frequencies.

ation is most readily obtained when is shown in Fig. 79. In such circuits, the oscillator voltage is applied to the mixer grid by inductive coupling, capacitive In the converter or mixer stage of a television receiver, stable oscillator opercoupling, or a combination of the two. typical television mixer-oscillator circuit separate tubes or tube sections are used for the oscillator and mixer functions. A grid in a pentode.



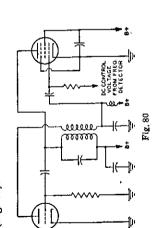
same envelope, such as the 6U8A and ent oscillator and mixer units in the Tubes containing electrically independ-6X8, are designed especially for application.

Automatic Frequency Control

requency to which the if stages are usting the frequency of the oscillator. pensate for slight changes in rf carrier or oscillator frequency as well as for inac-(afc) circuit provides a means of correcting automatically the intermediate frewhen, for any reason, it drifts from the tuned. This correction is made by ad-Such a circuit will automatically com-An automatic frequency control quency of a superheterodyne receiver curate manual or push-button tuning.

An afc system requires two sections: a frequency detector and a variable re-

de control voltage is used to control the to the amount of frequency shift. This actance. The detector section may be essentially the same as the FM detector illustrated in Fig. 57 and discussed under Detection. In the afe system, however, the output is a de control voltage, the magnitude of which is proportional grid bias of an electron tube which comorises the variable reactance section (Fig. 80).

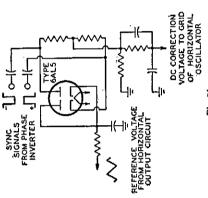


tube determines the magnitude of the ner as a reactance. The grid bias of the a control of this grid bias can be used to plate voltage of the reactance tube are almost 90° out of phase, the control tube effective reactance and, consequently, The plate current of the reactance tube is shunted across the oscillator tank circuit. Because the plate current and affects the tank circuit in the same mancontrol the oscillator frequency.

Automatic frequency control is also discriminator circuit, is usually employed to control the frequency of a multivibrator-type horizontal-oscillator circuit. The 6AL5 detector supplies a de changes in its operating frequency. The magnitude and polarity of the control voltages are determined by phase relationships in the afc circuit at a given used in television receivers to keep the horizontal oscillator in step with the cps) at the transmitter. A widely used This circuit, which is often referred to as a balanced-phase-detector or phasecontrol voltage to the grid of the horizontal-oscillator tube which counteracts horizontal-scanning frequency (15,750 horizontal afe circuit is shown in Fig. 81.

The horizontal sync pulses obtained from the sync-separator circuit are fed through a single-triode phase-inverter or moment.

= Electron Tube Applications phase-splitter circuit to the two diode units of the 6AL5. Because of the action of the phase-inverter circuit, the signals



cuit is also applied simultaneously to phase. A reference sawtooth voltage obapplied to the two diode units are equal in amplitude but 180 degrees out of tained from the horizontal output cir-

both units. Any change in the oscillator between the reference sawtooth and the one diode unit of the 6AL5 to conduct more heavily than the other, and thus requency alters the phase relationship incoming horizontal sync pulses, causing producing a correction signal. The system remains balanced at all times, therebecause momentary changes in oscillator frequency are instantaneously corrected by the action of the control voltage. fore,

The diode units of the 6AL5 are biased so that conduction takes place The relative position of the sync pulses waveform at any given instant determines which diode unit conducts more heavily, and thereby establishes the voltage. The network between the diode units and the grid of the horizontal-oscilator tube is essentially a low-pass filter which prevents the horizontal sync pulses from affecting the horizontal-oscillator only during the tips of the sync pulses. on the retrace portion of the sawtooth magnitude and polarity of the control performance.

The installation of electron tubes requires care if high-quality performance is to be obtained from the associated circuits. Installation suggestions and precautions which are generally common to all types of tubes are covered in this section. Careful observance of these suggestions will do much to help the experimenter and electronic technician obtain the full performance capabilities of radio tubes and circuits. Additional pertinent information is given under each tube type and in the CIRCUIT SECTORY.

Filament and Heater Power Supply

The design of electron tubes allows for some variation in the voltage and currentsupplied to the filament or heater, but most satisfactory results are obtained from operation at the rated values. When the voltage is low, the temperature of the cathode is below normal, with the result that electron emission is limited. The limited emission may cause unsatisfactory operation and reduced tube life. On the other hand, high cathode voltage may cause rapid evaporation of cathode material and shorten tube life.

To insure proper tube operation, it is important that the filament or heater voltage be checked at the socket terminals by means of a high-resistance voltmeter while the equipment is in operation. In the case of series operation of heaters or filaments, correct adjustment can be checked by means of an ammeter in the heater or filament circuit.

The filament or heater voltage supply may be a direct-current source (a battery or a dc power line) or an alternating-current power line, depending on the type of service and type of tube. Frequently, a resistor (either variable or fixed) is used with a dc supply to permit compensation for battery voltage at the socket terminals to the correct value. Ordinarily, a step-down transformer is used with an ac supply to pro-

vide the proper filament or heater voltage. Receivers intended for operation on both dc and ac power lines have the heaters connected in series with a suitable resistor and supplied directly from the power line.

DC filament or heater operation should be considered on the basis of the tery supply for the 1.4-volt filament tubes, it is unnecessary to use a voltagedropping resistor in series with the filament and a single dry-cell; the filaments of these tubes are designed to operate satisfactorily over the range of voltage variations that normally occur during the life of a dry-cell. Likewise, no series resistor is required when the 1.25-volt filamentsubminiatures are operated from a single 1.5-volt flashlight-type dry-cell, when the 2-volt filament type tubes are operated from a single storage cell, or when the 6.3-volt series are operated source of power. In the case of the batfrom a 6-volt storage battery.

In the case of dry-battery supply for 2-volt filament tubes, a variable resistor in series with the filament and the battery is required to compensate for battery variations. Turning the set on and off by means of the rheostat is advised to prevent over-voltage conditions after an off-period because the voltage of dry-cells rises during off-periods.

In the case of storage-battery supply, air-cell-battery supply, or dc power supply, a non-adjustable resistor of suitable value may be used. It is well to check initial operating conditions, and thus the resistor value, by means of a voltmeter or ammeter.

AC filament or heater operation should be considered on the basis of either a parallel or a series arrangement of filaments and/or heaters. In the case of the parallel arrangement, a step-down transformer is employed. Precautions should be taken to see that the line voltage is the same as that for which the primary of the transformer is designed. The line voltage may be determined by

measurement with an ac voltmeter (0-150 volts).

If the line voltage measures in excess of that for which the transformer is designed, a resistor should be placed in series with the primary to reduce the line voltage to the rated value of the transformer primary. Unless this is done, the excess input voltage will cause proportionally excessive voltage to be applied to the tubes. Any electron tube may be damaged or made inoperative by excessive operating voltages.

If the line voltage is consistently below that for which the primary of the transformer is designed, it may be necessary to install a booster transformer between the acoutlet and the transformer primary. Before such a transformer is installed, the ac line fluctuations should be very carefully noted. Some radio sets are equipped with a line-voltage switch which permits adjustment of the power transformer primary to the line voltage. When this switch is properly adjusted, the series-resistor or booster-transformer method of controlling line voltage is seldom required.

In the case of the series arrangements of filaments and/or heaters, a voltage-dropping resistance in series with the heaters and the supply line is usually required. This resistance should be of such value that, for normal line voltage, tubes will operate at their rated heater or filament current. The method for calculating the resistor value is given below.

When the filaments of battery-type tubes are connected in series, the total filament current of the filament supply and the plate and grid-No.2 currents (cathode current) returning to B(-) through the tube filaments. Consequently, in a series filament string it is necessary to add shunt resistors across each filament section to bypass this cathode current in order to maintain the filament voltage at its rated value.

The filament or heater resistor required when filaments and/or heaters are operated in parallel can be determined easily by a simple formula derived from Ohm's law.

Required resistance (ohms) -

supply volts - rated volts of tube type total rated filament current (amperes)

Thus, if a receiver using two IT4's, one IR5, one IU5, and one 3V4 is to be operated from a storage battery, the series resistor is equal to 2 volts (the voltage from a single storage cell) minus 1.4 volts (voltage rating for these tubes) divided by 0.3 ampere (the sum of 4 × 0.05 ampere + 1 × 0.1 ampere), i.e., approximately 2 ohms. Since this resistor should be variable to allow adjustern for battery depreciation, it is advisable to obtain the next larger commercial size, although any value between 2 and 3 ohms will be quite satisfactory.

Where much power is dissipated in the resistor, the wattage rating should be sufficiently large to prevent overheating. The power dissipation in watts is equal to the voltage drop in the resistor multiplied by the total filament current in amperes. Thus, for the example above, $0.6 \times 0.3 = 0.18$ watt. In this case, the value is so small that any commercial rheostat with suitable resistance will be adequate.

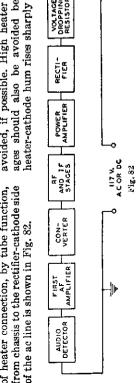
For the case where the heaters and/ or filaments of several tubes are operated in series, the resistor value is calculated by the following formula, also derived from Ohm's law. Required resistance (ohms) = supply volts - total rated volts of tubes

rated amperes of tubes

Thus, if a receiver having one 6BE6, one 6BA6, one 6AT6, one 25L6GT, and one 25L6GT is to be operated from a 117-volt power line, the series resistor is equal to 117 volts (the supply voltage) minus 68.9 volts (the sum of 3×6.3 volts $+ 2 \times 25$ volts) divided by 0.3 ampere (current rating of these tubes), i.e., approximately 160 ohms. The wattage dissipation in the resistor will be 117 volts minus 68.9 volts times 0.3 ampere, or approximately 14.4 watts. A resistor having a wattage rating in excess of this value should be chosen.

When the series-heater connection is used in ac/dc receivers, it is usually advisable to arrange the heaters in the circuit so that the tubes most sensitive to hum disturbances are at or near the ground potential of the circuit. This arrangement reduces the amount of ac

The balanced arrangement described High grid-circuit impedances should be avoided, if possible. High heater voltages should also be avoided because heater-cathode hum rises sharply when above also minimizes heater-grid hum.



Heater-to-Cathode Connection

connected across the winding, or to one end of the heater supply winding, decircuits, it is important to keep the heater-cathode voltage within the maxiated from ac, their cathodes may be reother components) to the mid-tap on the heater supply winding, to the midpending on circuit requirements. In all When heater-type tubes are operturned (through resistors, capacitors, or tap of a small resistor (about 50 ohms) num ratings specified for the tube.

ode can develop a small voltage across the cathode-circuit impedance and cause objectionable hum. The use of a large cathode bypass capacitor is recomfield surrounding the heater. When a large resistor is used between heater and strings), or when one side of the heater Heater-typetubesmay produce hum a result of conduction between heater and cathode or between heater and control grid, or by modulation of the electron stream by the alternating magnetic cathode (as in series-connected heater is grounded, even a minute pulsating eakage current between heater and cathmended to minimize this source of hum.

Much lower hum levels can be achieved when heaters are connected in preferably, connected to a positive bias source of 15 to 80 volts dc to reduce the flow of alternating current. The heater leads of the tubes should be twisted and The balanced ac supply provides almost parallel systems in which the center-tap kept away from high-impedance circuits. complete cancellation of the alternatof the heater supply is grounded or, ing-current components.

the heater voltage is increased above the published value.

high-fidelity audio equipment. Examples Certain tube types are designed especially to minimize hum in high-quality, are the 5879, 7025, and 7199.

Plate Voltage Supply

voltage value for any tube type should formance is to be obtained. Plate volt-The plate voltage for electron tubes local generators. The maximum platenot be exceeded if most satisfactory perage should not be applied to a tube unless the corresponding recommended It is recommended that the primary obtained from batteries, rectifiers, direct-current power lines, and small voltage is also supplied to the grid.

circuit of the power transformer be fused to protect the rectifier tube(s), the power transformer, filter capacitor, and chokes in case a rectifier tube fails.

Grid Voltage Supply

grid circuit. The first method is called "fixed bias"; the second is called "cathode bias" or "self bias"; the third is called "grid-resistor bias" and is sometimes incorrectly referred to in receivingsatisfactory performance. Grid voltage may be obtained from a fixed source the voltage divider of the high-voltage de supply, from the voltage drop across The recommended grid voltages for different operating conditions have been carefully determined to give the most such as a separate C-battery or a tap on a resistor in the cathode circuit, or from the voltage drop across a resistor in the In any case, the object is to make tube practice as "zero-bias operation."

Electron Tube Installation

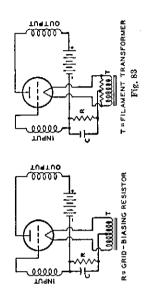
heater-cathode type. If the filament is the grid negative with respect to the cathode by the specified voltage. When a C-battery is used, the negative terminal is connected to the grid return and the positive terminal is connected to the negative filament socket terminal, or to the cathode terminal if the tube is of the supplied with alternating current, this connection is usually made to the cen-This method reduces hum disturbances caused by the ac supply. If bias voltages are obtained from the voltage divider of a high-voltage de supply, the grid return is connected to a more negative tap ter-tap of a low resistance (20-50 ohms) shunted across the filament terminals. than the cathode.

the plate and grid-No.2 currents in the quired negative grid-bias voltage can be lizes the voltage drop produced by the sistor connected between the cathode ply. (See Fig. 83.) The cathode current is, of course, equal to the plate current case of a tetrode, pentode, or beam power tube. Because the voltage drop The cathode-biasing method uticathode current flowing through a reand the negative terminal of the B-supin the case of a triode, or to the sum of along the resistance is increasingly negative with respect to the cathode, the re-

ploy more than three electrodes, the rent of more than one tube passes through total current determines the size of the the resistor, or if the tube or tubes em-1000/3 = 3000 ohms. If the cathode cur-

distortion by introducing degeneration into the circuit. However, the use of an unbypassed resistor decreases gain and power sensitivity. When bypassing is used, it is important that the bypass capacitor be sufficiently large to have usually is bypassed. In af circuits the use of an unbypassed resistor will reduce ments. In rf circuits the cathode resistor negligible reactance at the lowest fresistor depends on circuit-design require-Bypassing of the cathode-bias requency to be amplified.

having high transconductance such as sary to shunt the bias resistor with a 0.001μ f) in order to prevent oscillations. The usual af bypass may or may not be generation is desired. In tubes having high values of transconductance, such as the 6BA6, 6CB6, and 6AC7, input capacitance and input conductance In the case of power-output tubes the beam power tubes, it may be necessmall mica capacitor (approximately used, depending on whether or not dechange appreciably with plate current.



TUSTUG

C = BYPASS CAPACITOR

obtained by connecting the grid return to the negative end of the resistance.

The value of the resistance for cathode-biasing a single tube can be determined from the following formula:

rated cathode current in milliamperes desired grid-bias voltage \times 1000 Resistance (ohms) -

Thus, the resistance required to produce 9 volts bias for a triode which operates at 3 milliamperes plate current is 9 X

method is used, the external grid-No.1to-plate (wiring) capacitances should be be bypassed to ac ground, and the grid The use of a cathode resistor to When such a tube having a separate rf amplifier, these changes may be minimized by leaving a certain portion of the cathode-bias resistor unbypassed. In order to minimize feedback when this kept to a minimum, the grid No.2 should No.3 should be connected to ac ground. suppressor-grid connection is used as an

19

able shift of electrode currents with the application of a signal. In such amplifor amplifiers in which there is apprecifiers, a separate fixed supply is recomobtain bias voltage is not recommended mended.

when the grid is driven positive. A large The grid-resistor biasing method grid current flowing in the grid-cathode circuit. This current is due to (1) an and cathode and (2) grid rectification value of resistance is required in order value and to avoid undesirable loading is also a self-bias method because it resistor produced by small amounts of tween the materials comprising the grid to limit this current to a very small utilizes the voltage drop across the grid electromotive potential difference beeffects on the preceding stage.

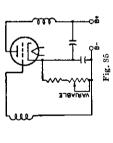
given in circuits 22-1 and 22-4 in the ally employing high-mu triodes) of audio circuits, the audio amplifier type 1U5 or tween the grid and the negative filament which is usually less than 1 volt. This pation will not be excessive under zero-Examples of this method of bias are CIRCUIT SECTION. In both of these or cathode to furnish the required bias method of biasing is used principally in amplifier circuits, where the tube dissi-12AV6 has a 10-megohm resistor bethe early voltage amplifier stages (ususignal conditions.

magnitude is usually in the order of 5 A grid resistor is also used in many oscillator circuits for obtaining the revoltage is relatively constant and its quired bias. In these circuits, the grid volts or more. Consequently, the bias voltage is obtained only through grid rectification. A relatively low value of Oscillator circuits employing this method of bias are given in circuits 22-1 and resistor, 0.1 megohm or less, is used. 22-4 in the CIRCUIT SECTION

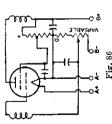
receiver volume. The variable voltage eter as shown in Fig. 86; or (3) from a if amplifier stages is a convenient and (1) from a variable cathode resistor as shown in Figs. 84 and 85; (2) from a bleeder circuit in which the bleeder cur-Grid-bias variation for the rf and frequently used method for controlling supplied to the grid may be obtained: bleeder circuit by means of a potentiom-

matic volume control. The latter circuit is shown in Fig. 60.

In all cases it is important that the control be arranged so that at no time will the bias be less than the recommended minimum grid-bias voltage for the particular tubes used. This requirement can be met by providing a fixed stop on the potentiometer, by connecting



cathode resistance in series with the have the control voltages extend over a Where receiver gain is controlled by grid-bias variation, it is advisable to wide range in order to minimize crossable resistance, or by connecting a fixed variable resistance used for regulation. modulation and modulation-distortion. a fixed resistance in series with the vari-

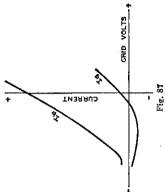


therefore, be used in the controlled A remote-cutoff type of tube should stages.

tential cathode, a positive grid current negative and increases rapidly as the In most tubes employing a unipobegins to flow when the grid is slightly

rent is varied by a tube used for auto-

grid is made more positive, as shown in Fig. 87. The value of grid voltage at cathode, and by the positive grid curwhich the grid-current curve intercepts material composition of the grid and the rent. For values of grid potentials which several different physical processes, including an electrothermal effect due to the differences in temperature and the horizontal axis is determined



are larger than this intercept, the direction of the grid current is positive (i.e., from the grid to the cathode). At smaller values of grid potential, the direction of the grid current is negative (i.e., from the cathode to the grid).

currents between the grid and cathode Positive grid current consists of electrons emitted from the cathode which are intercepted by the control grid. Negative grid current, which becomes appreciable only when the grid potential is more negative than the value of the intercept, is a result of the emission of electrons from the heated control grid to the cathode, the effect of gas molecules in the tube, and the influence of leakage and the grid and the plate.

The value of grid potential at the rent flows in the grid circuit, and the dynamic input resistance of the tube intercept of the grid-current curve on the horizontal axis (often mistakenly called contact potential) may be as high as 11/2 volts. If the operating bias of the tube is less than this intercept, it is found that two effects are present. Direct curmay be relatively low. It is generally desirable to supply the tube with a value of bias sufficiently high so that the operating point of the tube is not near the value of this intercept. If the value of

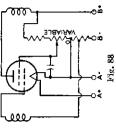
the intercept care should be taken to avoid undesirable effects in the grid cirthe operating b'as is near the value of cuit due to grid current or low input resistance.

Electron Tube Installation

Screen-Grid Voltage Supply

grid (grid No.2) of screen-grid tubes may be obtained from a tap on a voltage tiometer rather than through a series divider, from a potentiometer, or from tube type and its application. The screen-The positive voltage for the screen a series resistor connected to a high-voltage source, depending on the particular tained from a voltage divider or a potenresistor from a high-voltage source because of the characteristic screen-grid current variations of tetrodes. Fig. 88 shows a tetrode with its screen-grid voltgrid voltage for tetrodes should be obage obtained from a potentiometer.

When pentodes or beam power tubes are operated under conditions where a age may be obtained through a series resistor from a high-voltage source. This large shift of plate and screen-grid curcation of the signal, the screen-grid voltmethod of supply is possible because of rents does not take place with the appli-

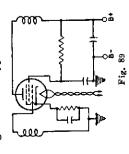


and resulting decrease in screen-grid current, the cutoff characteristic of a current characteristic in pentodes and beam power tubes. Because the screengrid voltage rises with increase in bias the high uniformity of the screen-grid pentode is extended by this method of supply.

This method is sometimes used to the cathode-biasing method, it miniincrease the range of signals which can be handled by a pentode. When used in ploying pentodes in combination with resistance-coupled amplifier circuits emmizes the need for circuit adjustments. Fig. 89 shows a pentode with its screen-

grid voltage supplied through a series

screen-grid current appears as a change the application of signal, the seriesresistor method of obtaining screen-grid voltage should not be used. A change in When power pentodes and beam power tubes are operated under conditions such that there is a large change in plate and screen-grid currents with



in the voltage drop across the series grid voltage should be obtained from a point in the plate-voltage-supply filter system having the correct voltage, or resistor in the screen-grid circuit; the result is a change in the power output and an increase in distortion. The screenfrom a separate source.

plate voltage of tetrodes, pentodes, and grid voltage. Otherwise, with voltage on the screen grid only, the screen-grid cur-It is important to note that the peam power tubes should be applied beore or simultaneously with the screenrent may rise high enough to cause excessive screen-grid dissipation.

age is varied, it must never exceed the be met by providing a fixed stop on the Screen-grid voltage variation for the rf amplifier stages has sometimes age lowers the transconductance of the by means of a potentiometer shunted rating of the tube. This requirement can been used for volume control in oldertype receivers. Reduced screen-grid voltube and results in reduced gain per stage. The voltage variation is obtained across the screen-grid voltage supply. (See Fig. 88.) When the screen-grid voltpotentiometer.

Shielding

In high-frequency stages having high gain, the output circuit of each stage must be shielded from the input circuit of that stage. Each high-frequency

stage also must be shielded from the other high-frequency stages. Unless shielding is employed, undesired feedback may occur and may produce many narmful effects on receiver performance.

capacitor to shield each section of the capacitor from the other section. The shielded by being mounted under the in a separate shield can. Baffle plates may be mounted on the ganged tuning oscillator coil may be especially well To prevent this feedback, it is a each unit of the high-frequency stages. For instance, in a superheterodyne receiver, each if and rf coil may be mounted desirable practice to shield separately chassis.

these shields are indicated in the socket grounded through its grounding pin as nection should be short and sturdy. Many modern tubes of glass construcin a receiver depend on the design of the vided by the metal shell which is tion have internal shields, usually connected to the cathode; where present, The shielding precautions required receiver and the layout of the parts. In all receivers having high-gain high-fre-quency stages, it is necessary to shield separately each tube in high-frequency stages. When metal tubes, and in particular the single-ended types, are used, complete shielding of each tube is prothe socket terminal. The grounding condiagram.

Dress of Circuit Leads

tors of each tube should be kept short tant. Because even a short lead provides of plate and screen-grid bypass capaciers, lead dress, that is, the location and arrangement of the leads used for connections in the receiver, is very impora large impedance at high frequencies, it is necessary to keep all high-frequency leads as short as possible. This precaution is especially important for ground connections and for all connections to bypass capacitors and high-frequency filter capacitors. The ground connections At high frequencies such as are encountered in FM and television receivand made directly to cathode ground.

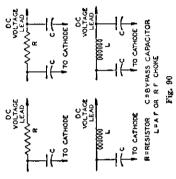
put circuits of high-frequency stages so that the possibility of stray coupling is with the lead dress of the input and out-Particular care should be taken

coshielded components should be dressed creases, the need for careful lead dress minimized. Unshielded leads connected close to the chassis. As the frequency inbecomes increasingly important.

In high-gain audio amplifiers, these same precautions should be taken to minimize the possibility of self-oscil-

Filters

age-supply circuits. Filters find an imleads to each tube in order to return the signal current through a low-impedance path direct to the tube cathode rather than by way of the voltage-supply circuit. Fig. 90 illustrates several forms of filter circuits. Capacitor C forms the Feedback effects also are caused in radio or television receivers by coupling between stages through common voltportant use in minimizing such effects. They should be placed in voltage-supply



ow-impedance path, while the choke or resistor assists in diverting the signal through the capacitor by offering a high impedance to the power-supply circuit.

In circuits where the current is small (a The choice between a resistor and a choke depends chiefly upon the permissible de voltage drop through the filter.

few milliamperes), resistors are practical; where the current is large or regulation important, chokes are more suitable.

Electron Tube Installation

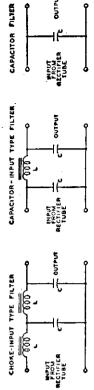
quency amplified should not be more The minimum practical size of the capacitors may be estimated in most than one-fifth of the impedance of the cases by the following rule: The impedance of the capacitor at the lowest frefilter choke or resistor at that frequency. Better results will be obtained in special eases if the ratio is not more than onetenth.

shields are employed, filters should be Radio-frequency circuits, partieuarly at high frequencies, require highpacitors are preferable. Where stage quality capacitors. Mica or ceramic caplaced within the shield.

fler tube. See Rectification. A smoothing ter because the load is an important filters is to smooth the output of a rectifilter usually consists of capacitors and iron-core chokes. In any filter-design problem, the load impedance must be age. Smoothing effect is obtained from iel with the load and store energy on the Another important application of factor in filter performance. Smoothing cause they are in series with the load and offer a high impedance to the ripple voltthe capacitors because they are in paralvoltage peaks; this energy is released on the voltage dips and serves to maintain the voltage at the load substantially constant. Smoothing filters are classified as choke-input or capacitor-input according to whether a choke or capacitor is placed next to the rectifier tube. See considered as an integral part of the fileffect is obtained from the chokes be-Fig. 91.

The CIRCUIT SECTION gives a number of examples of rectifier circuits with recommended filter constants.

If an input capacitor is used, consideration must be given to the instan-



QU1Pd?

C = FILTER CAPACITOR L. FILTER CHOKE

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choke method is used, the available de taneous peak value of the ac input voltage. This peak value is about 1.4 times the rms value as measured by an ac voltmeter. Filter capacitors, therefore, especially the input capacitor, should have a rating high enough to withstand the instantaneous peak value if breakdown is to be avoided. When the input-

fier tubes occasionally produce a form of power line. This interference is generally tunable 120-cycle buzz (100 cycles for 60-cycle supply line, etc.). It is usually caused by the formation of a steep wave begins to flow on the positive half of Mercury-vapor and gas-filled rectilocal interference in radio receivers through direct radiation or through the identified in the receiver as a broadly front when plate current within the tube peak current will be obtained.

There are several ways of eliminating this type of interference. One is an rf choke having an inductance of one millihenry or more between each plate to shield the tube. Another is to insert and transformer winding and to connect high-voltage, rf bypass capacitors between the outside ends of the transformer in the shielding of the tube. The rf bypass winding and the center tap. (See Fig. 92.) The rf chokes should be placed witheach cycle of the ac supply voltage.

TUBE SHIELD L=RF CHOKE C=RF BY PASS CAPACITOR, MICA ELECTROSTATIC SHIELD

capacitors should have a voltage rating high enough to withstand the peak voltage of each half of the secondary, which is approximately 1.4 times the rms value.

Transformers having electrostatic shielding between primary and secondary are not likely to transmit rf disturb-

short. In general, the particular method of interference elimination must be selectthe plate leads of the rectifier extremely ed by experiment for each installation.

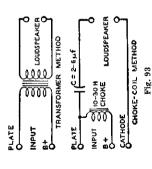
Output-Coupling Devices

in the plate circuit of a power output An output-coupling device is used tube to keep the comparatively high dc plate current from the winding of an electromagnetic speaker and, also, to put stage to a loudspeaker of either the transfer power efficiently from the outelectromagnetic or dynamic type.

> output voltage will be somewhat lower than with the input-capacitor method for a given ac plate voltage. However, improved regulation together with lower

Output-coupling devices are of two winding for the signal voltage. The choke-coil output coupling device, howformer. The choke-capacitor type includes an iron-core choke having an inductance of not less than 10 henries which is placed in series with the plate and B-supply. The choke offers a very low resistance to the dc plate current component of the signal voltage but opposes the flow of the fluctuating compofarads supplies a path to the speaker types, (1) choke-capacitor and (2) transnent. A bypass capacitor of 2 to 6 microever, is now only of historical interest.

The transformer type is constructed with two separate windings, a primary winding to meet the requirements of its ments of each type of coupling device are shown in Fig. 93. Examples of trans-This construction permits designing each position in the circuit. Typical arrangeformers for push-pull stages are shown and a secondary wound on an iron core.



in several of the circuits given in the CIRCUIT SECTION.

High-Fidelity Systems

The results achieved from any high-

components, and wiring, and attempts hum, and other operating difficulties, as plifier systems be undertaken only by persons who have had some experience in the layout, mechanical construction, large degree upon the skill and care with which the system is constructed. Improper placement of transformers, other to achieve excessive compactness, can only result in instability, oscillation, well as in damage to components by overheating. It is important, therefore, that construction of high-fidelity amidelity amplifier system depend to and wiring of audio equipment.

It is impractical to give specific and supplementary units because the construction data for various amplifiers best arrangement for each unit or combination of units will depend on the rehowever, to list some general consideraquirements of the user. It is possible, tions which should be observed in the construction of any high-fidelity amplifier system.

bus of heavy wire. This bus should be of minimum signal voltage, i.e., at the ticularly those carrying ac, should be connections, especially from the input Internal wiring for ac-operated tube connected to the chassis only at the point Any amplifier having two or more stages should be constructed with a minals. Power-supply connections, partogether with power-supply conductors. heaters, switches, pilot-light sockets, and other devices, should be twisted and placed flat against the chassis. All connections to the ground side of the circuit in each unit should be made to a common straight-line layout so that maximum separation is provided between the signal input and output circuits and terisolated as far as possible from signal even when shielded, should not be cabled connection. Signal-carrying conductors, signal-input terminal of the unit.

sible, and as far as possible above the audio frequencies due to stray shunt capacitance. All connections between units should be made with shielded cable 30 picofarads per foot, such as Alpha All internal wiring that carries sigchassis, to minimize losses at the higher having a capacitance of not more than Lype 1249 or 1704, Belden Type 8401 nal voltages should be as short as pos-

or 8410, or equivalent cable.

er-supply units of high-fidelity systems tube or component on the same side of in such a manner as to assure adequate ponents. A beam power tube or rectifier the chassis by at least 11/2 tube diamthey should be constructed and installed ventilation for the tubes and other comtube should be separated from any other Because power amplifiers and pownormally dissipate large amounts of heat,

vided with mounting feet, perforated holes around each tube socket to permit relatively cool air to enter from below Power amplifiers and power-supply units which are to be installed horizontally (i.e., with the tubes vertical) in cabinets or on shelves should be proand provide ventilation for the under bottom covers, and a number of small side of the chassis and tubes.

nels of a stereophonic system), should chassis without careful consideration to the mechanical layout should be planned est signal levels are farthest from the output stage and power supply. Amplisimultaneously (such as preamplifiers for graph pickups) may be installed side by side on the same chassis without danger of interaction. Units which operate sinot be installed side by side on the same placement of components and wiring, and the possible use of shielding to pre-If a power amplifier, tone-control amplifier, and one or more preamplifiers so that the circuits operating at the lowfier units which normally operate at comparable signal levels but are not used tape pickup heads and magnetic phonomultaneously, however (such as the chanare to be constructed on the same chassis,

former on or near the amplifier unit. If eet from its power-supply unit, the assure that each tube receives its rated heater voltage. In cases where very large such a transformer is installed on or near a preamplifier for a magnetic-tape pickheater-current conductors in the powersupply cable must be large enough to ply cables are involved, it may be desirable to install a heater-supply transmixer, or other unit requiring heater power is located more than five or six heater currents or very long power-sup-When an amplifier, preamplifier, vent interaction.

may be eliminated simply by making

ances to the line. Often the interference

up head, a magnetic phonograph pickup, or a dynamic microphone, the transformer should be completely shielded and positioned to prevent its field from inducing hum in the pickup device.

High-Voltage Considerations for Television Picture Tubes

Like other high-voltage devices, television picture tubes require that certain precautions be observed to minimize the possibility of failure caused by humidity, dust, and corona.

Humidity, curso, curson the Humidity is high, a continuous film of moisture may form on the glass bulb immediately surrounding the ultor cavity cap of all-glass picture tubes or on the glass part of the envelope of metal picture tubes. This film may permit sparking to take place over the glass surface to the external conductive coating or to the metal shell. Such sparking may introduce noise into the receiver. To prevent such a possibility, the uncoated bulb surface around the cap and the glass part of the envelope of metal picture tubes should be kept clean and dry.

Dust Considerations. The accumulation of dust on the uncoated area of the bulb around the glass part of the envelope or insulating supports for metal picture tubes will decrease the insulating qualities of these parts. The dust usually consists of fibrous materials and may contain soluble salts. The fibers absorb and retain moisture; the soluble salts provide electrical leakage paths that increases. The resulting high leakage currents may overload the high-voltage power supply.

It is recommended, therefore, that the uncoated bulb surface of all-glass picture tubes and the coated glass surface and insulating supports for metal picture tubes be kept clean and free from dust or other contamination such as finger-prints. The frosted Filterglass faceplate of the metal picture tubes may be cleaned with a soapless detergent, such as Dreft, then rinsed with clean water, and immediately dried.

water, and immediately uned.

Corona Considerations. A highvoltage system may be subject to corona,
especially when the humidity is high,

unless suitable precautions are taken. Corona, which is an electrical discharge appearing on the surface of a conductor when the voltage gradient exceeds the breakdown value of air, causes deferioration of organic insulating materials through formation of ozone, and induces arc-over at points and sharp edges. Sharp points or other irregularities on any part of the high-voltage system may increase the possibility of corona and should be avoided.

sent a smooth electrical surface with In the metal-shell picture tubes, the metal lip at the maximum diameter has rounded edges to prevent corona. Adequate spacing between the lip and any grounded element in the receiver, or beween the small end of the metal shell and any grounded element, should be corona. Such spacing should not be less than 1 inch of air. Similarly, an air space of 1 inch, or equivalent, should be provided around the body of the metal shell. As a further precaution to prevent corona, the deflecting-yoke surface on the end adjacent to the shell should prerespect to the small end of the metal shell or the ultor terminal of all-glass provided to preclude the possibility of hibes.

Picture-Tube Safety Considerations

Tube Handling. Breakage of picture tubes, which contain a high vacuum, may result in injury from flying glass. Do not strike or scratch the tube or subject it to more than moderate pressure when installing it in or removing it from electronic equipment.

High-Voltage Precautions. In picture-tube circuits, high voltages may appear at normally low-potential points in the circuit because of capacitor breakdown or incorrect circuit connections. Is touched the power-supply switch should be turned off, the power plug disconnected, and both terminals of any capacitors grounded.

X.Ray Radiation Precautions. All types of picture tubes may be operated at voltages (if ratings permit) up to 16 kilovolts without producing harmful x-ray radiation or danger of personal injury on prolonged exposure at close range. Above 16 kilovolts, special x-ray shielding precautions may be necessary.

Interpretation of Tube Data

The tube data given in the following TUBE TYPES SECTION include ratings, typical operation values, characteristics, and characteristic curves.

heated, the cathode is taken as the other electrode voltages, and electrode dc, the negative filament terminal is electrode voltages are referred. For types is taken as the datum point. For types supply voltages are given with reference For types having filaments heated with taken as the datum point to which other having filaments heated with ac, the mid-point (i.e., the center tap on the filament-transformer secondary, or the midpoint on a resistor shunting the filament) having unipotential cathodes indirectly The values for grid-bias voltages, to a specified datum point as follows: datum point.

Ratings are established on electron tube types to help equipment designers utilize the performance and service capabilities of each tube type to best advantage. Ratings are given for those characteristics which careful study and experience indicate must be kept within certain limits to insure satisfactory performance.

Three rating systems are in use by the electron-tube industry. The oldest is known as the Absolute Maximum system, the next as the Design Genter System, and the latest and newest as the Design Maximum system. Definitions of these systems have been formulated by the Joint Electron Tube Engineering Council (JETEC)* and standardized by the National Electrical Manufacturers Association (VEMA) and the Electronic Industries Association (EIA) as follows:

Absolute Maximum ratings are lim-

ting values which should not be exceeded with any tube of the specified type under any condition of operation. These ratings are used only in rare instances for receiving types, but are gen-

erally used for transmitting and industrial types.

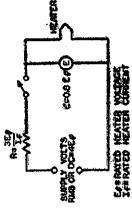
Design Center ratings are limiting

values which should not be exceeded with a tube of the specified type having characteristics equal to the published values under normal operating conditions. These ratings, which include allowances for normal variations in both tube characteristics and operating conditions, were used for most receiving tubes prior to 1957. Unless specified otherwise, ratings given in the TUBE TYPES SECTION are based on the Design Center System.

Design Maximum ratings are limiting values which should not be exceeded with a tube of the specified type having characteristics equal to the published values under any conditions of operation. These ratings include allowances for normal variations in tube characteristics, but do not provide for variations in operating conditions. Design Maximum ratings were adopted for receiving tubes in 1967.

Electrode voltage and current ratings are in general self-explanatory, but a brief explanation of other ratings will aid in the understanding and interpretation of tube data.

Heater warm-up time is defined as the time required for the voltage across the heater to reach 80 per cent of the rated value in the circuit shown in Fig. 94. The heater is placed in series with a



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Now identified as the Joint Electron Device En-

gineering Council (JEDEC).

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Plate dissipation is the power dissipated in the form of heat by the plate as a result of electron bombardment. It is the difference between the power supplied to the plate of the tube and the power delivered by the tube to the load.

Grid-No.2 (Screen-grid) Input is the power applied to the grid-No. 2 electrode and consists essentially of the power dissipated in the form of heat by grid No. 2 as a result of electron bombardment, With tetrodes and pentodes, the power dissipated in the screen-grid circuit is added to the power in the plate circuit to obtain the total B-supply input power.

plied through a series voltage is supplied through a series voltage-dropping resistor, the maximum screen-grid voltage rating may be exceeded, provided the maximum screen-grid dissipation rating is not exceeded at any signal condition, and the maximum screen-grid voltage rating is not exceeded at the

maximum-signal condition. Provided these conditions are fulfilled, the screengrid supply voltage may be as high as, but not above, the maximum plate voltage rating.

as shown in Fig. 95. (This curve cannot permissible at screen-grid voltages up to ply voltage, the screen-grid input must screen-grid input follows a curve of the for applications utilizing either a grid voltage-dropping resistor. When a a voltage-dropping resistor is used, the be assumed to apply to types other than those for which it is specified in the data section.) Full rated screen-grid input is cent point to the full rated value of supbe decreased. The decrease in allowable to determine that the screen-grid input area on the chart at the selected value of screen-grid voltage to be used. When as listed in the data section, the maximum permissible screen-grid (grid-No.2) input varies with the screen-grid voltage, 50 per cent of the maximum rated screengrid supply voltage. From the 50-perparabolic form. This rating chart is usefixedscreen-grid voltage or aseriesscreenfixed voltage is used, it is necessary only is within the boundary of the operating For certain voltage amplifier types, Ξ

minimum value of resistor that will assure tube operation within the boundary of the curve can be determined from the following relation:

$$R_{g_2} \ge \frac{Ees (Eces-Ees)}{Pes}$$

where R_{g2} is the minimum value for the voltage-dropping resistor in ohms, E_{c3} is the selected screen-grid voltage in volts, E_{cc2} is the screen-grid supply voltage in volts, and R_{c3} is the screen-grid input in watts corresponding to E_{cc2} .

Peak heater-cathode voltage is the highest instantaneous value of voltage that a tube can safely stand between its heater and cathode. This rating is applied to tubes having a separate cathode terminal and used in applications where excessive voltage may be introduced between heater and cathode.

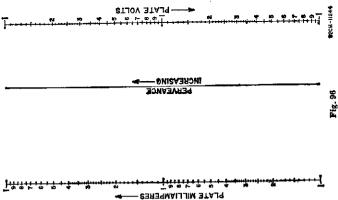
Maximum de output current is the highest average plate current which can be handled continuously by a rectifier tube. Its value for any rectifier tube type is based on the permissible plate dissipation of that type. Under operating conditions involving a rapidly repeating duty cycle (steady load), the average plate current may be measured with a de meter.

The nomograph shown in Fig. 96 can be used to determine tube voltage drop or plate current for any diode unit when values for a single plate-voltage, plate-current condition are available from the data. It can also be used to compare the relative perveance $(G-I_b/E_b\,8/2)$ of several diodes. Perveance can be considered a figure of merit for diodes; high-perveance units have lower voltage drop at a fixed current level.

Tube voltage drop or plate current voltage values are then located on the ing line with the perveance scale is then ing to a desired current value, or the value of plate current corresponding to a desired tube voltage drop. Because the pivot point for a specific diode unit repare selected for the plate-voltage and scales and connected with a straight edge. The intersection of the connectused as a pivot point to determine the for a specific diode unit can be determined as follows: First, convenient values plate-current scales of the nomograph. The published plate-current and platevalue of tube voltage drop correspond-

resents its perveance, the pivot points for several units (plotted to the same scales) can be used to compare their relative perveance.

For example, type 5U4GB has a tube voltage drop (per plate) of 44 volts at a plate current of 225 milliamperes.

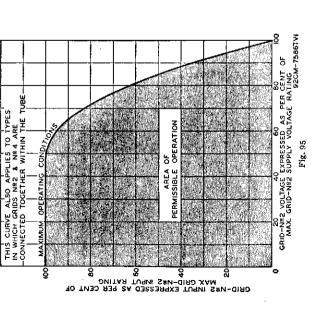


Convenient scales for this type are from 1 to 100 volts for plate voltage and from 10 to 1000 milliamperes for plate current. The points 44 volts and 225 milliamperes are then connected with a straight line to determine the pivot point. It is easy to determine such values as a plate current of 150 milliamperes at a tube voltage drop of 38 volts, or a voltage drop of 25 for a current of 100 milliamperes.

For readings in the order of one volt and/or one milliampere, the nomograph is not accurate because of the effects of contact potential and initial electron velocity.

electron velocity.

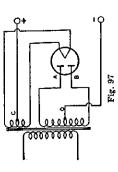
Maximum peak plate current is the highest instantaneous plate current that a tube can safely carry recurrently in the direction of normal current flow.



The value of peak plate current in a given rectifier circuit is largely determined by filter constants. If a large choke is used at the filter input, the peak plate current; but if a large capacitor is used as the filter input, the peak current may be many times the load current. In order to determine accurately the peak plate current in any rectifier circuit, measure it with a peak-indicating meter or use an oscillograph.

Maximum peak inverse plate voltage is the highest instantaneous plate voltage which the tube can withstand recurrently in the direction opposite to that in which it is designed to pass current. For mercury-vapor tubes and gastrent, and the safe top value to prevent arc-back in the tube operating within the specified temperature range.

Referring to Fig. 97, when plate A of a full-wave rectifier tube is positive, current flows from A to C, but not from B to C, because B is negative. At the instant plate A is positive, the flament is positive (at high voltage) with respect to positive at high voltage between the positive filament and the negative plate B is



in inverse relation to that causing current flow. The peak value of this voltage is limited by the resistance and nature of the path between plate B and filament. The maximum value of this voltage at which there is no danger of breakdown of the tube is known as maximum peak inverse voltage.

Voltage, rms value of ac input voltage, and dc output voltage depend largely on the individual characteristics of the rec-

tifier circuit and the power supply. The presence of line surges or any other transient, or wave-form distortion, may raise the actual peak voltage to a value higher than that calculated for sine-wave voltages. Therefore, the actual inverse voltage, and not the calculated value, should be such as not to exceed the rated maximum peak inverse voltage for the rectifier tube. A calibrated cathode-ray oscillograph or a peak-indicating electronic voltmeter is useful in determining the actual peak inverse voltage.

In single-phase, full-wave circuits with sine-wave input and with no capacitor across the output, the peak inverse voltage on a rectifier tube is approximately 1.4 times the rms value of the plate voltage applied to the tube. In single-phase, half-wave circuits with sine-wave input and with capacitor input to the filter, the peak inverse voltage may be as high as 2.8 times the rms value of the applied plate voltage. In polyphase circuits, mathematical determination of peak inverse voltage runsination of peak inverse voltage runsulation of peak inverse voltage runsulation of peak inverse voltage requires the use of vectors.

The Rating Chart for full-wave rectifiers presents graphically the relationships between maximum ac voltage input and maximum de output current derived from the fundamental ratings for conditions of capacitor-input and choke-input filters. This graphical presentation provides for considerable latitude in choice of operating conditions.

The Operation Characteristics for a full-wave rectifier with capacitorinput filter show by means of boundary line the limiting current and voltage relationships presented in the Rating Chart.

The Operation Characteristics for a full-wave rectifier with choke-input filter not only show by means of boundary line the limiting current and voltage relationships presented in the Rating Chart, but also give some information as to the effect on regulation of various sizes of chokes. The solid-line curves show the dc voltage outputs which would be obtained if the filter chokes had infinite inductance. The long-dash lines radiating from the zero position are boundary lines for various sizes of chokes as indicated. The intersection of one of these lines with a solid-line curve indi-

cates the point on the curve at which the choke no longer behaves as though it had infinite inductance. To the left of the choke boundary line, the regulation curves depart from the solid-line curves as shown by the representative shortdash regulation curves.

Typical Operation Values. Values for typical operation are given for many types in the TUBE TYPES SECTION. These typical operating values are given to show concisely some guiding information for the use of each type. These values should not be confused with ratings, because a tube can be used under any suitable conditions within its maximum ratings, according to the application.

The power output value for any operating condition is an approximate tube output—that is, plate input minus plate loss. Circuit losses must be subtracted from tube output in order to determine the useful output.

Characteristics are covered in the ELECTRON TUBE CHARACTER-ISTICSSECTION and such data should be interpreted in accordance with the definitions given in that section. Characteristics of an average tube. Individual tubes, like any manufactured product, may have characteristics that range above or below the values given in the characteristic curves.

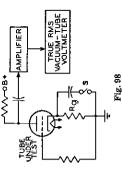
Although some curves are extended well beyond the maximum ratings of the tube, this extension has been made only for convenience in calculations. Do NOT operate a tube outside of its maximum ratings.

Interelectrode capacitances are direct capacitances measured between specified elements or groups of elements in electron tubes. Unless otherwise indicated in the data, all capacitances are measured with filament or heater cold, with no direct voltages present, and with no external shields. All electrodes other than those between which capacitance is being measured are grounded. In twin or multi-unit types, inactive units are also grounded.

The capacitance between the input electrode and all other electrodes, except the output electrode, connected together is commonly known as the input capacitance. The capacitance between the out-

put electrode and all other electrodes, except the input electrode, connected together is known as the output capacitance.

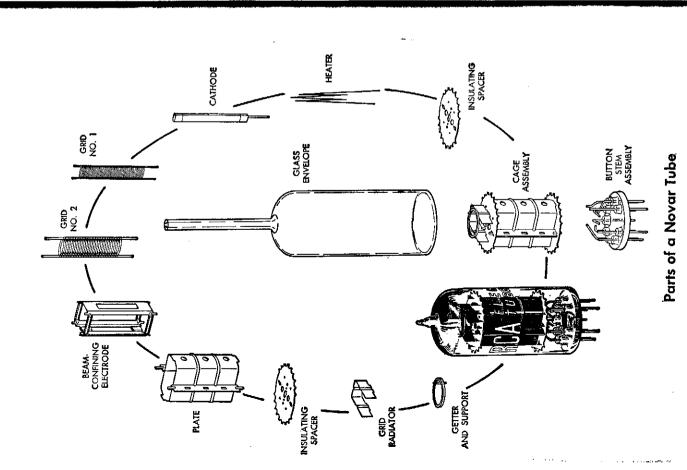
Hum and noise characteristics of high-fidelity audio amplifier tube types such as the 7025 and the 7199 are tested in an amplifier circuit such as that shown in Fig. 98. The output of the test circuit is fed into a low-noise amplifier. The



bandwidth of this amplifier depends on the characteristic being measured. If hum alone is being tested, a relatively narrow bandwidth is used to include both the line frequency and the major harmonics generated by the tube under test. In noise or combination hum-and-noise measurements, the bandwidth is defined in the registration of the tube type.

The amplifier gain is calibrated so that the vacuum-tube voltmeter measures hum and noise in microvolts referenced to the grid of the tube under test. A pentode can also be evaluated in this manner by the addition of a screen-grid supply adequately bypassed at the tube screen-grid pin connection. Power-supply ripple at the plate of the tube under test must be negligible compared to its hum and noise output. Extraordinary shielding of both the test socket and the associated operating circuit is required to minimize capacitances between heater leads and high-impedance connections.

The test-circuit components are determined by the tube type being tested and the type of hum to be controlled. Heater-cathode hum can be eliminated from the measurement by closing St. The circuit can also be made more or less sensitive to heater-grid hum by increasing or decreasing the grid resistance Rg. No circuit changes affect the component of magnetic hum generated by



for RCA Receiving Tubes Application Guide

lowing pages, RCA receiving tubes are classified in two ways: (a) by function, and (b) by structure (diode, triode, etc.). The functional classification covers 38 principal types of application, as listed In the Application Guide on the folbelow.

Tube types are grouped by structure under each classification; they are also keyed to indicate miniature, octal, nuvistor, and novar types.

dium-, or high-mu types on the following basis: low, less than 10; medium, 10 or more, but less than 50; high, 50 or more. Triodes are designated as low-, me-

negative control-grid voltage to the screen-grid voltage (or, for triodes, the istics or typical operation values. These Where applicable, tubes are designated as sharp-, semiremote, or remote-cutoff on the basis of the ratio, in per cent, of the terms are defined as follows: sharp, less plate voltage) as given in the characterthan 10 per cent; semiremote, 10 or more, but less than 20 per cent; remote, 20 per cent or more.

types, refer to the TECHNICAL DATA For more complete data on these FOR RCA RECEIVING TUBES starting on page 83.

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Audio-Frequency	13. Discriminators	26. Phase Inverters
Amplifiers	14. Frequency Dividers	27. Phase Splitters
Automatic Gain Control	15. FM Detectors	28. Radio-Frequency
(AGC and AVC) Circuits	16. Gated Noise, AGC, and	Amplifiers
Burst Amplifiers	Sync Amplifiers	29. Reactance Circuits
Cathode-Drive RF Ampli-	17. Harmonic Generators	30. Rectifiers
fiers (Grounded-Grid)	18. Horizontal-Deflection	31. Regulators
Color Killers	Circuits	32. Relay Control Circu
Color Matrixing Circuits	19. Intermediate-Frequency	33. Sync Amplifiers
Complex-Wave	81	34. Sync Clippers
Generators		35, Sync Separators
Converters		36. Tuning Indicators
Dampers	22. Mixer-Oscillators—RF	37. Vertical-Deflection
Demodulators (Color TV)	23. Multivibrators	Circuits
Detectors	24. Noise Inverters	38. Video Amplifiers
UC Kestorers	Z5. Oscillators	

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1. AUDIO-	1. AUDIO-FREQUENCY	X	High-Mu Triode	ode	
AMPLIFIERS	FIERS		0 12SF5		
			High-Mu Trie	High-Mu Triode with Twin Diode	Diode
Voltage Amplifiers	nlifters		• 3AV6	• 6CN7	0 12807
WIT Danie	0 000		• 4AV6	o 6SQ7	o 12SQ7GT
Medium-Mu	Medium-Mu Triode with Twin Diode	rin Diode	• 6AT6	• 6SQ7GT	• 14GT8
• 6BF6	• 12BF6	o 125R7	• 6AV6	• 12AT6	• 18FY6
o 6SR7	-		• 6BN8	• 12AV6	• 18FY6A
Modium.Mu	Triode, Share	Modium.Mr. Triode. Show. Curoff Dentode	High-Mu Tri	High-Mu Triode with Triple Diode	Diode
• 7199	A LIGHT CHARLE	caron r enrore	• 5T8	• 6T8A	• 19T8
-			High-Mu Twin Triode	n Triode	
Medium-Mu Twin Triode	Twin Triode		• 6EU7 +	• 12AZ7	o 12SL7GT
• 516	• 7AU7	o 12SN7GTA	SELTCT .	• 12AZ7A	• 20EZ7
• 6J6A	• 9AU7	• 19 1 6	• 12AX7 +	• 12BZ7	• 7025 +
o 6SN7GTB	• 12AU7A		• 12AX7A+		
	1.74,		2	4 V Link 6.3.	1
• Minne	o Cera	D Nuvietor	Novar	Tror nign-noc	I For nigh-nacility equipment.

Manual
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• 125Q7 • 125Q7GT • 14GT8 • 18FY6 • 18FY6

4DT6A* 5GX6*	• 6GX6*	- 7543 +	• 3658	• 46S8	• 6HS8
temote-Culof	Remote-Cutoff Pentode with Diode • 12CR6	ode	3. BURST	AMPLIFIERS	
Power Amp	Amplifiers		Medium-Mn . SEA8	Medium-Mn Triode-Sharp-Cutoff Pentode 5EA8 66H8A	toff Pentode
Power Triode			• 5GH8	• 6CH8	
2A3			High-Mu Tri	High-Mu Triode with Twin Diodes	des
Beam Fower Tube	Lube		0000		
5AQ5 5CZ5	o 6L6GC†	• 25F5A • 34GD5		i	
SV6GT	o 6V6GTA	• 34CD5A	4. CATHO	CATHODE DRIVE RF	AMPLI.
6AQ5A	o 6W6GT	• 35B5	FIERS (FIERS (GROUNDED-GRID)	:RD)
6AS5	o 6Y6G	• 35C5			
• 6CM6	• 12AB5	o SalloCT	Mediam-mu 1610de	1 F10de	
	• 12CA5	• 50C5		:	
• 6DG6GT	• 12CU5/12C5	o SOFES	Medium-Mu Twin Triode	Twin Triode	ļ
• 6DS5	o 12L6GT	. 50L6GT	• 4BC8	• 5BK7A	• 6BQ7A
. 6GC5	o 12V6GT	• 6973†	• 4BU7A	WZ)AZ	60B38
o 6FE5	o 12W6CT	o 7027A†	• 4B27	• 6BK7A	6FW.8
9T90	• 25C5	0.7408 ∤		•	
o block t			High-Mu Triode		;
Power Pentode			▷ 2CW4	• 6AB4	▶ 6DS4
• 6BQ5	• 8BQ5	• 50FK5	₽2D24	P 0 C W 4	
• 6EH5	• 12EHS	- 50FX5	High-Mu Twin	Ε	
0 OF 0	- 25EHS	- 786R+	• 6DT8	• 12AZ7	• 12DT8
o 6K6GT	• 50EH5	2	• 12AT7	• 12AZ7A	
2. AUTOM	AUTOMATIC GAIN CONTROL	NTROL	5. COLOR	5. COLOR KILLERS	
CIRCUI	CIRCUITS (AGC & AVC)	ខា	-	1	
)iode—Shari • 6KL3	Diode—Sharp-Cutoff Pentode		• 6JUS	anor.	
Diode—Remo	-Remote-Cutoff Pentode	• 20EQ7	6. COLOR	6. COLOR MATRIXING CIRCUITS	CIRCUITS
'win Diode-	Twin Diode—Medium Mn Triode	4	Medium-Mu Twin Triode	Twin Triode	
6BF6 6SR7	• 12BF6	0 12SR7	• 6CG7 • 6FQ7	• 6GU7 • 8CG7	• 8FQ7 • 12BH7A
' 'win Diode	Twin Diode—High-Mn Triode				
-34V6	20890	20800	7 COMPI	COMPLEX.WAVE CENERA.	VER A.
• 4AV6	0 6SO7GT	012SO7GT			
• 6AT6	• 12AT6	• 18FY6	LOKS		
• 6AV6	• 12AV6	• 18FY6A	High-Mu Tw	High-Mu Twin Double-Plate Triode	riode
Tedium-Mn 5	Medium-Mn Triode—Sharn-Cutoff Pentode	off Pentode	• 12FQ8		
SAN8	• 6BA8A	• 6CU8	Shorn Cutoff	Shown Putoff Twin. Plata Totanda Dioda	de_Diode
• 5GH8	• 6BH8	• 6GH8	• 6FA7		
• 6AN8A	• 6CH8	• 6GB8A	;	8	
• 6AZ8			Sharp-Cutoff	Sharp-Cutoff Three-Flate Tetrode—Diode	xte—Diode
ligh-Ma Tria	High-Mn Triode-Sharp-Cutoff Pentode	Pentode	• OF 141 O		
• 6AW8A	• 8AW8A	• 8JV8	Three-Plate	Three-Plate Tetrode-Medium-Mn Triode	-Mn Triode

	8. CONVERTERS	TERS		iode—Me	
BU8				• GBF6 • 12BF6	o 125R7
200	Medium-Mu I Flode	riode-Sharp-Cuton Pentode	r Fentone	o 65K7	
	• 5EA8	• 5X8	• 0KE8	Twin Diode—High-Mu Triode	
	• 5GH8	+ 6EA8	Vana.	• 34V6 • 6CN7	0 12507
11.	• 5KE8	• 6GH8	60X8		o 12SO7GT
	• 208	• 6GH8A	9 T9 X 8		• 14GT8
entode	Hint Mr. Twin	Trinde			• 18FY6
CH8A	ELEDTS	• 12AZ7	• 12DT8		• 18FY6A
	• 12AT7	• 12AZ7A			
		0		Triple Dode	
	Sharp-Curon remode	entoge • 1941f6	• 18CD64	i fro	
	• 0400	1480	-	Diode—H	
71 T.	Pentagrid			• 5T8 • 6T8A	• 19T8
	• 6BA7	• 12BA7	o 12SA7CT	Onadennie Diode	
_	• 6BE6	• 12BE6	• 18FX6	• 6/108	
	o 65A7	O LESA?	- TOLVOY		
	o 6SA7GT		•	Sharp-Cutoff Peniode	49409
	9. DAMPERS	S			• 6HZ6
4200		?			
5 2 2	Half-Wave (Diode)	iode)		12. DC RESTORERS	
R27	o 6AU4CTA	0 6W4CT	▶ 17BS3	6 to 10 in 1	
FWA	o 6AX4GT	o 12AX4GTA	o 17D4	Sparp-Cu	0047
	o 6AX4GTB	o 12AX4GTB	o 17 DE4	• 5AMB • 5AM6A	Deso.
	• 6AY3	▶ 12AY3	o 17DM4	• 5AS8	
DS4	▶ 6BA3	▶ 12BS3	o 19AU4	Triple Diode	
	• 6BH3	o 12D4	0 19AU4	• 6BJ7	
	► 6BS3	o 12DM4	CLA	1	
2DT8	0 bCQ4	LIANACI	- 99DE4	13. DISCRIMINATORS	
	0 0 DA	P 17AY3	254X4	F.17.	
	o 6DM4	• 17BH3	CT.	L IVI	
	▶ 6DW4			iode	4
.,				• 3AL5 • 6AL5	• 12AL5
	10. DEMOI	10. DEMODULATORS (COLOR TV)	LOR TV)	lode—Hi	
	Medium-Mu Twin Triode	Iwin Triode			
	• 12BH7A			Triple Diode—High-Mu Triode	* 19T8
TITLE	High-Mu Twin Triode	a Triode			
	• 12AZ7	• 12AZ7A	•	Beam Tube	• 6BN6
i d	Sharp-Cutoff Pentode	Pentode			!
PO.	• 6GY6			FM Quadrature-Crid	
	Pentagrid Amplifier	րիններ		Sharp-Cutoff Peniode	98039
	• 6BY6				• 6HZ6
	11. DETECTORS	TORS			
	Diode Cham	Diede Sham Cate & Dentede		abe	
	Diode-Shari	-catour remous	• 6KL8	• 3BN6 • 4BN6	• 6BN6
	• 5AS8	• 6AS8	• 12KL8	Horizontal AFC	
iode	Diode-Remo	Diode-Remote-Cutoff Pentode		Twin Diode-High-Mu Triode	
† †	• 6EQ7	• 12EQ7	• 20EQ7	• 6BN8 • 6CN7	
210016	. IZCRO			14. FREQUENCY DIVIDERS	SRS
200	win Diode	, 646	AH91.	High-Mu Twin Dauble-Plate Triode	iode
	• 6AL5	• 12AL5		• 12FQ8	
'	100		and the second	o-lund +	* Dual-control grids
ipmeni	• Miniature	o Octal	A LAW LOAD		

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15. FM DETECTORS	High-Mu Triode—	Sharp-Cutoff Pentode	entode
	•	6KV8	• 8JV8
	• 6GN8	• 8AW8A	• 10HF8
diet oot dolon damit o ot	_	• 8GN8	• 11KV8
IO. GALED NOISE, ACC, AND	• 6Jv8		
SYNC AMPLIFIERS	Sharp-Cutoff Pentode	ode	
Girl Mr. Tuicde Cham Cr. of Descendant	• 3AU6	• 5EW6	• 6DC6
i I riode	-	6AB7	• 6DE6
• 6KAS • SKAS	• 3CB6	o 6AC7	• 6DK6
Sharp-Cutoff Pentode	• 3CF6	6AG5	• 6EJ7
▶6GY6*	• 3DK6	6AH6	• 6EW6
	• 3JCe	6AK5	• 6HS6
id Amplifier	•	9AV6	• 6JC6
• 3BY6 • 6BY6 • 6CS6	• 4AU6	6AU6A	• 6JD6
• 3CS6	• 4CB6	6BC5	• 12AU6
	•	6CB6	• 12AW6
17. HARMONIC GENERATORS	•	6CB6A	• 18GD6A
(See 7. COMPLEX-WAVE GENERATORS)	• 4JD6"	6CF6	• 19HS6
•	Sharp-Cutoff Pentode with Diode	ode with Diode	
18 HORIZONTAL DEFIRETION	_	• 6AMBA	• 6KL8
CIPCIII TOTAL	9456	0A58	912424
CIRCUITS	note-Cutoff	F Pentode	
Oscillators	•	6ЕН7	• 6JH6
	-	6CM6	• 12BZ6
edium-Mu Irlode—Sharp-Cuton	_	• 6HK6	• 19HR6
• SCRS • OGRS • OGRSA	0790 •		
Medium-Mu Twin Triode	Remote-Cntoff Pentode	ntode	
• 6CG7 • 8CG7 • 12AU7		• 12BA6	• 18FW6
• 8FQ7	-	o 12SK7	• 18FW6A
o 6SN7GTB • 9AU7 o 12SN7.	o 6SK7CT o	o 12SK7GT	
1.001.	Cutoff Pe	ntode with Dio	de
Amplifiers	- 27 SEC -	• IZEŲ	• 20EQ?
	20. LIMITERS		
SCHOOL SOUTH CITE	Beam Tube		
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	• 3BN6	• 4BN6	• 6BN6
TB/ o 12AV5GA	Sharn Cutoff Dontodo	970	
	a 3 A 176	e 6GX6	A12A16
o 6CB5A 12CU6 o 17GW6	_	6HS6	0 125H7
GA 0 12DQ6A .		• 6HZ6	• 19HS6
o 12DQ6B	_	o 6SH7	
60000 FIGUR 6.25R06.	Sharn-Cutoff Pentode with Diode	ode with Diode	
o 12GW6	• 6KL8	12KL8	
• 12JB6	Outdistant to		
• 6GT5 0 25DN6	21. MIXERS—RF	KF	-
	m-Mu Twi	Triode	,
19. INTERMEDIATE-FREQUENCY AMPLIETERS	• 516 • 616A	• 12AY?	• 1910
	High Ma Triode		
Medium-Mu Triode-Sharp-Cutoff Tetrode		• 6AB4	▶ 6CW4
	99 MIXER-OSCII.LATORS-RF	CILLATORS	7. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
-Ma Trio	Medium.Mr TriodeSharn.Cutoff Tetrode	e-Sharm Cuto	ff Tetrode
BANS BALSS COULDS	• 5CL8A	• 6CL8A	• 6008
• 6CH8			

• 5B8	. 5X8	o OPP CO			
• 5BR8	• 6AT8A	• 6U8A	26. PHASE	26. PHASE INVERTERS	
00000	• 6FC94	10548			
• 5EA8	• 6EA8	• 19X8	Medium-Mu 7	Medium-Mu Triode—High-Mu Triode • 120 W 7	Triode
High-Mu Twin Triode	1 Triode		Modium Mr. Turin Turodo	win Toloda	
• 6DT8	• 12AT7	• 12DT8	• 6CG7	**************************************	o 125N7-
Triode-Hexode	e . 1917.8		• 6CU7 • 6SN7CTB	• 9AU7 • 12AU7A	GTA
92 MIII TH	92 MIII TIVIBRATORS		High Mu Tric	High Mu Triode-Sharp-Cutoff Pentode	Pentode
23. MUD. 1	CHOINHUI		• 6AW8A	• 611F8	• 8GN8
Medium-Mu T • 5CH8	Medium-Mu Triode—Sharp-Cutoff Pentode . 5CH8 . 6CH8A	toff Pentode • 6CH8A	• 6EB8 • 6GN8	• 8AW8A • 8EB8	• 10HF8
Medium. Mu Twin Triode	win Triode		High-Mu Twin Triode	n Triode	
• 6CG7	-7AU7	o 125N7-	° 65C7	• 12AX7A	0 12SL7GT
• 6GU7 • 6SN7CTB	• 9AU7 • 12AU7A	GTA	• 68L7GT	o 12SC7	9792
High-Mu Twin Triode • 12AX7	n Triode		97 DUACE	97 DHASE SDITTERS	
24. NOISE	24. NOISE INVERTERS		Medium-Mn Trinde-	- 1	4 A MARKO Sharm-Cutoff Tetrode
T. W. T.	1. Cl C	. D	• 5008	_	
• 6KA8	de—Sharp-Calon rentode • 8KA8	rebroae	Medium-Mu Triode-		-Sharp-Cutoff Pentode
Sharp-Cutoff Pentode	Pentode		• 5AN8 • 6AN8	• 6BABA • 6CH8	• 6CUB • 7199
25. OSCILLATORS	ATORS		High-Mu Trio	High-Mu Triode—Sharp-Cutoff Pentode	Pentode
Radio Frequency-	ency-UHF		• 6AW8A	• 8AW8A	
Medium-Mu Triode	riode		00		
• 24F4B	• 3AF4A • 2D74	• 6AF4A	28. KADIO	28. KADIO-FREQUENCY	
• 2DZ4	• 6AF4	• 6DZ4	AMPLIFIERS	FIERS	
Radio Frequency-	ency-VHF		Medium-Mu Triode	riode	ļ
Medium-Mu Twin Triode	win Triode		• 2BN4A • 3BN4A	• 6BC4	• 6FN4A
• 516	• 12AV7	• 1916	Medînm-Mn 1	Medium-Mn Triode—Sharm-Cuioff Tetroda	toff Tetrod
Polo.			• 5008	• 6CQ8	
High-Mu Triode • 6AB4	qe		Medium-Mu Twin Triode	win Triode	
Power Triode			• 4BC8	• 5]6	• 6BZ7
• 6C4 (Class C)			• 4BS8	• 6BK7B	• 6.16A
Low Frequer	Low Frequency Sugen Tyne	•	• 4RZ7	• 6BQ7A	• 12AV7
Modium Mr. 7	Tribals Street Co.	,	• 5BK7A	• 6BS8	• 1916
. 5AN8		toff Pentode	• 5BQ7A		
• 6AN8A	• 68H8	• 6CX8	High-Mu Triode		
• 6AU8A	• 6CH8	• 8CX8	▷2CW4	• 6AB4	• 6FH5
• 6AZ8			> ZDS4	5 6 DS4	• 6F(35A
High Mu Trio	High Mu Triode with Twin Diode	de	*3CK5	• 6ER5	▶13CW4
• 6BN8	• 6CN7		Hioh.Mn Twin Triode	. Triode	
High-Mu Triode-	de—Sharp-Cutoff Pentode	Pentode	• 6DF8	• 12AZ7A	• 12DT8

Ministure o Octal D Nuvistor P Novar
 Dual-control grids

П
Manuat
Tube
Receiving
= RCA

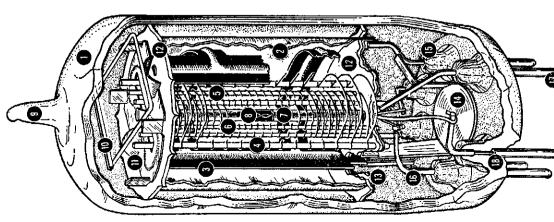
Power Triode		_	High-Voltage Types (For rf-rectifier or	or rf-rectifier or
• 6C4 (Class C)			pulsed low-current applications)-	tions)—Vacuum
Sharp-Cutoff Tetrode	rode	•	Half. Wave (Diode)	
• 2CY5	• 6CY5	• 6FV6	olb3GT olK3	8.843
• 3CY5		<u> </u>	_	0 3A3
Sharp-Cutoff Pentode	lode		IBSGT • IX2B	o 3B2
• 3AU6	• 6AK5	• 6DE6	777	
• 3BC5	• 6AU6A	o 6SH7		
• 3CB6	• 6BC5	o 65J7	31. REGULATORS	
• 3CF6	• 6BH6	• 12AU6		
• 4CB6	• 0CB6	• 12AW0	High-Voltage, Low Current	rrent
o 6AB7	• 6CF6	012517	Sharn-Cutoff Beam Triode	ď
o 6AC7	• 6DC6	18GD6A	o 6BK4	.
• 6AG5				
Sharn-Cutoff Pentode with Diode	stode with Diodo	•	32. RELAY CONTROL CIRCUITS	OL CIRCUITS
• 6KL8	• 12KL8	1		
			Medium-Mu Iwin Iriode	
note-Cuto	off Pentode			
0 6567	o 125G7		High-Mn Twin Triode	
Remote-Cutoff Pentode	entode		• OF V	
• 3BA6	o 65K7GT	o 12SK7GT		
• 6BA6	• 12BA6	• 18FW6	33. SYNC AMPLIFIERS	SRS
• 6BJ6	o 12SK7	• 18FW6A		:
o 65K7			Ma Triode-	-Sharp-Cutoff Pentode
Remote-Cutoff P	entode with Dio	de	• 6AU8A • 6CX8	• 8CX8
• 6EQ7 • 12EQ7 •	• 12EQ7	• 20EQ7		
			Medium-Mu Twin Triode • 6CG7	• 12AU7A
29. REACTANCE CIRCUITS	NCE CIRCUI	22	" Triode	
Modium Mr. Priodo Chom Curoff Dones de	do Cham Cub	of Deserted A	• 6CN7	
ATCUTUM-PILL A FIG	ne-Snarp-Cuit	, 60'Te	Will W. T 1.	
• 6AN8A	• 6BA8A	• 6CU8	**ATTENTIAL TOUGH STATES STATE	Cuton Fentode • 8JV8
High Mn Triade with Twin Diades	with Twin Diad	9	• 6JV8	
• 6CN7			High-Mu Twin Triode	
High-Mu Triode-	-Sharp-Cutoff Pentode	Pentode		
• 6AW8A	•		STATES OF TRANSPORT	**
			54. SINC CLIFFER	0
30. RECTIFIERS	ERS		Medium-Ma Triode—Sha	-Sharp-Cutoff Tetrode
Power-Supply Types—Vacuum	Types-Vacui	nm	M. Taiode	Shown Cutoff Dontodo
	١,			rp-caton rentoae
ve (Diod	(e)	6	-	• 6CA6
• 35W4 • 35Z5GT	• 36AM3A • 36AM3B	• 50DC4		
			High-Mu Triode-Sharp-	-Sharp-Cutoff Pentode
ě	(Twin Diode)	i	• 6AW8A • 6JV8	• 8GN8
	05V3A	0.524	_	
• 5BC3	0574GA	• 6CA4	• 6CW8 • 8EB8	• 10HF8
5DJ4	o 5X64	• 6X4	onra	
5U4 C	o 5Y3GT	o 6X5GT	High-Mu Twin Triode	
o 5U4 GB	o 5Y4CT	• 12X4	• 12BZ7	ļ
• Miniature	o Octal	tal	⊳ Navistor	▶ Novar

---- Application Guide ---

• 3688	• 4BU8 • 4GS8	• 6BU8 • 6HS8	• 6CM7	• 6CS7	• 8CM7
Ė.	Amplifier • 6BY6	• 6CS6	High-Mu Tric • 6CY7 • 6DR7 • 6EA7	Triode—Low-Mu Triode • 66E7 • 10BR7	iode 10GF7 13EM7 13GF7
35, SYNC S	35. SYNC SEPARATORS		1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	o Toron	
Medium-Mu Triode- • 5CQ8 • 6C	riode—Sharp-Cu • 6CQ8	-Sharp-Cutoff Tetrode	High-Mu Tric	High-Mu Triode—Beam Power Tube • 15KY8	er Tube
Medium-Mn Triode- 5 5 ANB 6 A S C H 8 6 C C 6 C A S C H 8 6 C C 6 C A U S A C C C C C C C C C C C C C C C C C C		Sharp-Cutoff Pentode 28 • 6GH8 18 • 6GH8A 38 • 8CX8	Amplifiers Low-Mu Triode • 1284A	ep P	
Medium-Mu Twin Triode	win Triode • 7AU7	• 12AU7A	Medium-Mu Triode • 684A	Friode	
High-Mu Trioo • 6CN7 High-Mu Trioo • 6AW8A	High-Mu Triode with Twin Diode • 6CN7 High-Mu Triode—Sharp-Cutoff Pentode • 6AW8	ode I Pentode • 8JV8	Beam Power Tube	Tube • 6AQ5A • 6CM6 • 6CZ5	• 6EM5 • 8EM5
• 6EB8 • 6GN8 • 6HF8 • 6JV8	• 6KV8 • 8AW8A • 8EB8	• 8KA8 • 10HF8 • 11KV8	Power Pentode	o	
High-Mu Twin Triode	1 Triode		38. VIDE0	38. VIDEO AMPLIFIERS	S
Sharp-Cutoff Twin Pentode • 3BU8 • 3GS8 • 4GS8	[win Pentode • 4BU8 • 4GS8	• 6BU8 • 6HS8	Medium-Mu Triode-	1255	Sharp-Cutoff Pentode 48A • 6CU8 H8 • 6CX8 H8 • 6CX8
Pentagrid Amplifier • 3BY6 • 6F	plifier • 6BY6	98799	• 6AZ8 High-Mu Tri	• 6AZ8 High-Mu Triode—Sharp-Cutoff Pentode	iff Pentode
36. TUNING	3 INDICATORS	RS	• 6EB8 • 6GN8	• 6KV8 • 6KV8	• 8JV8 • 10HF8
Indicator with Triode Unit 6E5 6U5	r Triode Unit 6US		• 6HF8 • 8EE	• SEBS Pentode	• 11KV8
Twin Indicator Units o 6AF6G	r Units		• 12BY7A		
37. VERTICAI CIRCUITS	VERTICAL DEFLECTION CIRCUITS	TION	Sharp-Cutoff • 5AM8 • 5AS8	Sharp-Cutoff Pentode with Diode • 5AM8 • 5AS8	iode • 6AS# 1
Oscillators a		(Combined)	Beam Power Tube	Tube	
Medium-Mu krode- • 6DE7 • 6EW7	.riode—Low-Mu Jriode • 16DE7	Triode • 13DE7	Power Pentode	de • 6CL6	• 6GK6
• Miniature	D	o Octal	⊳ Nuvistor		Novar

For information on picture tubes, refer to the RCA PICTURE TUBE CHAR-ACTERISTICS CHART at the end of the TECHNICAL DATA section.

2



Structure of a Miniature Tube

82

1—Glass Envelope

2-Internal Shield

3—Plate

4-Grid No. 3 (Suppressor)

5-Grid No. 2 (Screen)

6-Grid No. 1 (Control Grid)

7—Cathode

8—Heater

9—Exhaust Tip

7 — EXIIGUST

10—Getter

11 — Spacer Shield Header

12—Insulating Spac<mark>er</mark>

13—Spacer Shield

14-Inter-Pin Shield

15—Glass Button-Stem Seal

16—Lead Wire

17-Base Pin

18—Glass-to-Metal Seal

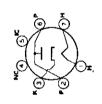
Technical Data for RCA Tube Types

This section contains technical descriptions of RCA tubes used in standard broadcast, FM, and television receivers, in audio amplifiers, and in many other diverse applications. It includes data on current types, as well as information on those RCA discontinued types in which there may still be some interest. Unless otherwise specified, the ratings given are based on the Design Center system. Information on picture tubes is shown at the end of this section.

In choosing tube types for the design of new electronic equipment, the designer should refer to the APPLICATION GUIDE FOR RCA RECEIVING TUBES on pages 75 to 81.

Tube types are listed in this section according to the numerical-alphabetical-numerical sequence of their type designations. For Key: Basing Diagrams, see inside back cover.

DIODE



Miniature type used as detector tube in portable FM receivers and in portable high-frequency measuring equipment. Outline Information of the seven-contact socket. Heater volts (ac. futre seven-contact section service: peak inverse plate volts, 330 mar; peak plate ma. 5 mar; de output ma. 0.5 mar; peak heater-cathode volts, 140 mar. This type is used principally for renewal purposes.

7



REMOTE-CUTOFF PENTODE

Glass type used in battery-operated receivers as to if amplifier. This type is smilar electrically to type 1D5-GP. Outline 248, OUTLINES SECTION. Tube requires four-contact effects. Filament volts (dc), 2.0; amperes, 0.06, Type 1A4-P is a DISCONTINUED type listed for reference only.

1A4P

POWER PENTODE

Glass octal type used in output stage of battery-operated receivers. Outline 14C, OUT-LINES SECTION. This type may be supplied with pin No.1 omitted. Tube requires octal socket and may be mounted in any position. For filament candiderations, refer to type 1U4. Filament voits (de), 14; amperes, 0.06. Typical operation as class A1 amplier: plate and grid-No.2 volts, 90

ASGI

Construction (de), 1.4; amperes, 0.06. Typical operation as class A1 amplifier: plate and grid-No.2 volts, 90 (110 max); grid-No.1 volts, 4.5; pask af grid-No.1 volts, 4.5; plate ma., 4.0; grid-No.2 ma., 1.1; plate resistance (approx.), 0.3 megohm; transeonductance, 850 µmhos; load resistance, 25000 ohms; power output, 115 milliwatts. Type 1A5-GT is used principally for renewal purposes.

Tube requires six-contact socket. Filament volts ceivers. This type is identical electrically with type 1D7-G, except for interelectrode capacitances, Outline 24B, OUTLINES SECTION. Glass type used in battery-operated re-(dc), 2.0; amperes, 0.06. Type 1A6 is a DISCON. TINUED type listed for reference only.



PENTAGRID CONVERTER

operation as converter: plate and grid-No.2 volts, 90 (110 max); grids-No.3-and-No.5 supply volts, Glass octal type used in superheterodyne circuits having battery power supplies. Outline 15A, OUTLINES SECTION. Tube requires octal socket and may be mounted in any position. Finament volts (dc), 1.4; amperes, 0.05. Typical

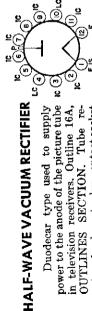
110 maz; grids-No.3-and-No.5 volts, 45 (60 maz); grid-No.4 volts, 0; grid-No.1 resistor, 0.2 meg-

ohm; plate resistance (approx.), 0.6 megobm; plate ma., 0.6; grids-No.5-and-No.5 ma., 0.7; grid-No.2 ma., 1.2; grid-No.1 ma., 0.035; total cathode ma., 2.5 (4 maz); conversion transconductance, 250 ambos. This type is used principally for renewal purposes.

POWER PENTODE

height, 1.5 inches; diameter, 0.4 inch. Tube rement volts (dc), 1.25; amperes, 0.04. Filament dimensions: over-all length, 1.75 inches; seated voltage should never exceed 1.6 volts. Typical Subminiature type used in output stage of small, compact, battery-operated receivers for the standard AM broadcast band. Maximum quires subminiature eight-contact socket. Fila-





power to the anode of the picture tube $\,$ $^{(3)}$ in television receivers. Outline 16A, Duodecar type used to supply quires duodecar twelve-contact socket OUTLINES SECTION. Tube re-

and may be mounted in any position. Socket terminals 4 and 10 may be used as tie points for components at or near filament potential. Filament volts (ac/dc), 1.25; amperes, 0.2.

PULSED RECTIFIER

		25000 max	0.5 40.00	2.0
For operation in a oxo-tine, so-frame system	Maximum Ratings, (Design-Maximum Values):	PEAK INVERSE PLATE VOLTAGER	PEAK PLATE CURRENT	AVERAGE PLATE CURRENT

D3 H volta

625-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds. The de component must not exceed 22000 volts.

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a

Tube Voltage Drop for plate current of 7 ma......

Characteristics, Instantaneous Value:

PENTAGRID CONVERTER



over-all length, 1.75 inches; seated height, 1.5 inches; diameter, 0.4 inch. Tube requires sub-Subminiature type used as rf or if amplifier in stages not controlled by ave in small, comard AM broadcast band. Maximum dimensions: miniature eight-contact socket. Filament volts (dc), 1.25; amperes, 0.04. Filament voltage pact, battery-operated receivers for the standshould never exceed 1.6 volts. Characteristics

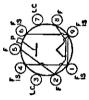
SHARP-CUTOFF PENTODE

= Technical Data =

1AD5

as class At amplifier; plate and grid-No.2 volts, 67.5 maz; grid-No.1 volts, 0; plate resistance, 0.7 megohm; transconductance, 735 µmhos; total cathode ma., 4 maz; plate ma., 1.85; grid-No.2 ma., 0.75. This is a DISCONTINUED type listed for reference only.

HALF-WAVE VACUUM RECTIFIER



voltage pulses produced in the scanning systems of television receivers. Outline 9A, OUTLINES SECTION. Tube requires miniature nine-contact socket. Socket terminals 3 and 7 may be connected to the filament, or used as tie points Minfature type used as rectifier of highshould not be used. Filament volts (ac), 1.4; for the filament-dropping registor; otherwise they

tifier in 525-line, 30-frame system: peak inverse plate volts (absolute maximum), 25000 max (de 20000 max); peak plate ma., 11 max; average plate ma., 1 max. For filament and high-voltage considerations, max); peak plate ma., 11 max; average plate ma., 1 max. For filament and hi refer to type 1B3-GT. Type 1AX2 is used principally for renewal purposes. amperes, 0.65. Maximum ratings as pulsed rec-



HALF-WAVE VACUUM RECTIFIER

low-current applications such as the rectifier in a high-voltage, rf-operated Glass octal type used in high-voltage, power supply or as a rectifier of highvoltage pulses produced in television scanning systems.

1.25° volta 0.2 ampere 1.3 pt 1.8 pt	FER 30-frame system 26000°max volts 50 max ma 50 max ma 50 max ma 50 max 50 m	RECTIFIER 100 volts	83000 max volts 85 max ma 1.1 max ms 1.5 to 100 Ke	per cent of one horizontal scanning cycle. In a scanning cycle is 10 microseconds.
FILAMENT VOLTAGE (AC/DC) FILAMENT CURRENT O.2 ampere DIRECT INTERESTANCE (Approx.): Plate to Filament and Internal Shield * Under no circumstances should the filament voltage be less than 1.05 volts or greater than 1.45 volts.	PULSED RECTIFIER For operation in a 625-line, 30-frame system Maximum Ratings, (Design-Maximum Values): PRAK PLAYB SOF PLAYE VOLTAGE* PRAK PLAYE CURRENT AVERAGE PLAYE CURRENT	Characteristics, Instantaneous Value: Tube Voltage Drop for plate current of 7 ma	Maximum Raiings, (Design-Maximum Values): Pear Inverse Plate Voltage Pear Plate Current Average Plate Christor Resquency Range Supply Voltage	* The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds. The dc component must not exceed 22000 volts.

INSTALLATION AND APPLICATION

terminal 7. Socket terminals 4 and 6 may be used as the points for components at or near filament potential. This type may be supplied with pins 1, 4, and/or 6 omitted. Outline 15D, OUTLINES SECTION. Plate connection is cap at top of bulb. Socket terminals 1, 3, 4, 5, 6, and 8 may be connected to socket terminal 7 or to a corona shield which is connected to socket Type 1B3-GT requires an octal socket and may be mounted in any position.

The high voltages at which the 1B3-GT is operated are very dangerous. Great care should be taken to prevent coming in contact with these high voltages. In ates at de potentials which can cause fatal shock. Extreme precautions must be guards which definitely eliminate all hazards to personnel. The filament transformer, those circuits where the filament circuit is not grounded, the filament circuit opertaken when the filament voltage is measured. These precautions must include safewhether it is of the iron-core or the air-core type, must be sufficiently insulated.

The voltages employed in some television receivers and other high-voltage equipment may be sufficiently high to cause high-voltage rectifier tubes such as the 1B3-GT to produce soft X-rays which can constitute a health hazard unless the tubes are adequately shielded. Relatively simple shielding should prove adequate,

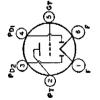
but the need for this precaution should be considered

SHARP-CUTOFF PENTODE

in battery-operated receivers. Outline 24B, OUT-LINES SECTION. Tube requires four-contact socket. For typical operating conditions and to type 1E5-GP. Filament volts (dc), 2.0; amperes, 0.06. Type 1B4-P as a DISCONTINUED Glass type used as rf amplifier or detector maximum ratings as a class A: amplifier, refer type listed for reference only.

TWIN DIODE -- MEDIUM-MU TRIODE

volts, 135 max; grid volts, -3; plate ma., 0.8; plate resistance, 85000 ohms; amplification factor, 20; transconductance, 575 µmhos. This is a DISCONTINUED type listed for reference only. ameter, 1-9/16 inches. Tube requires six-contact socket. Filament volts (dc), 2.0; amperes, 0.06. Glass type used as combined detector, amplifier, and ave tube in battery-operated receivers. Maximum dimensions: over-all length, 4-3/16 inches; seated height, 8-9/16 inches; di-Typical operation as class A₁ amplifier: plate



PENTAGRID CONVERTER

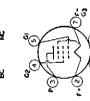
type listed for reference only. The IB7-GT may be replaced by the 1A7-GT if circuit adjustment is made for lower flament current of Glass octal type used in superheterodyne circuits having battery power supply. Outline 15A, OUTLINES SECTION. Filament volts (de), 1.4; amperer, 0.1. This is a DISCONTINUED

POWER PENTODE

transconductance, 1550 µmhos; load resistance, 8000 ohms; power output, Typical operation as class A1 amplifier: plate and grid-No.2 volts, 90 (110 max); grid-No.1 volts, -7.5; peak af grid-No.1 volts, 7.5; plate ma., 7.8; grid-No.2 ma., 8.5; plate resistance Giase octal type used in output stage of battery-operated receivers. Outline 14C, OUT-LINES SECTION. This type may be supplied with pln No.1 omitted. Tube requires octal socket. Filament volts (dc), 1.4; amperes, 0.1. (approx.), 115000 ohms; transconductance, 1550 µmhos; load resistan 240 milliwatta. Type 1C5-GT is used principally for renewalpurposes.

PENTAGRID CONVERTER

eeptforinterelectrodecapacitances. Outline 24B, OUTLINES SECTION. Tube requires six-contact socket. Filament volts (dc), 2.0; amperes, 0.12. Type 1C6 is a DISCONTINUED type peivers. Similar electrically to type 1C7-G ex-Glass type used in battery-operated reisted for reference only.



PENTAGRID CONVERTER

= Technical Data =

ter: plate volts, 180 max; grids-No.3-and-No.5 Glass octal type used in battery-operated receivers, Outline 23, OUTLINES SECTION. grid) supply volts, 180 (applied through 20000-ohm dropping resistor bypassed by 0.01-uf 'ube requires octal socket. Filament volts (dc), 2.0; amperes, 0.12. Typical operation as conver-(acreen-grid) volts, 67.5 max; grid-No.2 (anodecapacitor); grid-No.4 (control-grid) volts, -3 ohn

107G

grid-No.1 (oscillator-grid) resistor, 60000 ohms; plate ma., 1.5; grids-No.3-and-No.5 ms., 2; grid-No.2 ms., 4; grid-No.1 ma., 0.2. This is a DISCONTINUED type listed for reference only.

REMOTE-CUTOFF PENTODE

Glass octal type used in battery-operated receivers as rf or if amplifier. Outline 23, OUT-LINES SECTION. Tube requires octal socket. operation as class A: amplifier: plate volts, 180 max; grid-No.2 (screen-grid) volts, 67.5 max; grid-No.1 volts, -3 min; plate ma., 2.3; grid-No.2 ma., 0.8; plate resistance (approx.), 1.0 megohm; ransconductance, 750 amhos; transconductance at bias of -15 volts, 15 amhos. This is a DIS-CONTINUED type listed for reference only. filament volts (dc), 2.0; amperes, 0.06. Typical

REMOTE-CUTOFF TETRODE

receivers as rt or if amplifier. Outline 23, OUT-LINES SECTION. Filament volts (dc), 2.0, amperes, 0.06. This is a DISCONTINUED type Glass octal type used in battery-operated listed for reference only. It is similar electrically to type 1D5-GP.

PENTAGRID CONVERTER

Giass octal type used in battery-operated receivers. Outline 28, OUTLINES SECTION. Tube requires octal socket. Filament volts (dc), 2.0; amperes, 0.06. Typical operation as converter: plate volts, grids-No.3-and-No.5 volts, grid-No.2 supply volts, grid-No.4 volts, and grid-No.1 1.3; grids-No.3-and-No.5 ma., 2.4; grid-No.2 ma., 2.3; grid-No.1 ma., 0.2. This is a DISCON-TINUED type listed for reference only. resistor are same as for type 1C7-G; plate ma,

DIODE—TRIODE—POWER PENTODE

or ave tube, triode as first audio amplifier, and pentode as power output tube. Outline 15A, OUTLINES SECTION. Tube requires octal Glass octal type used in compact battery-operated receivers. Diode unit is used as detector Typical operation of pentode unit as class A₁ amplifier: plate and grid-No.2 volts, 90 (110 max); socket. Filament volts (dc), 1.4; amperes, 0.1.

grid-No.1 volts, -9; plate ma., 5; grid-No.2 ma., 1; transconductance, 925 µmhos; load resistance, 12000 ohms; total harmonic distortion, 10 per cent; power output, 200 milliwatta. Characteristics of triode unit as class A1 amplifier: plate volts, 90 (110 max); grid volts, 0; amplification factor, 25; plate resistance (approx.), 43500 ohms; transconductance, 576 amhos; plate ma., 1.1. This is a DISCONTINUED type listed for reference only.



RCA Receiving Tube Manual

PENTODE SEMIREMOTE-CUTOFF DIODE

portable radio receivers as combined AM detector and af voltage amplifier. Outline 7B, OUTLINES SECTION. Tube requires minis-Miniature type used in battery-operated ture seven-contact socket and may be mounted peres, 0.05. Characteristics of pentode unit as in any position. Filament volts (dc), 1.4; amclass A: amplifier: plate and grid-No.2 (screen-

grid) volts, 67.5 (90 max); grid-No.1 volts, 0; 0.6 megohm; transconductance, 630 µmhos; plate ma., 2.1; grid-No.2 ma., plate resistance (approx.), 0.6 megohm; transconductance, 630 µmhos; plate ma., z.1; griu-моле ше., 0.56. Maximum diode rating: plate ma., 0.25 *max.* This type is used principally for renewal purposes.

SHARP-CUTOFF PENTODE

Glass octal type used as rf amplifier or detector in battery-operated receivers. Outline 23, OUTLINES SECTION. Tube requires octal Characteristics as class A. amplifier: plate volts, 180 max; grid-No.2 volts, 67.5 max; grid-No.1 volts, -3; plate ma., 1.7; grid-No.2 ma., 0.6; socket. Filament volts (dc), 2.0; amperes, 0.06. plate resistance, 1.5 megohms; transconductance, 650 µmhos. This is a DISCONTINUED type listed for reference only.

TWIN POWER PENTODE

Glass octal type used in push-pull output fier: plate and grid-No.2 volts, 185 max; grid-No.1 volts, -7.5; plate ma., 10.5; grid-No.2 ma., 3.5; output watts, 0.575. This is a DISCONstage of battery-operated receivers. Outline 14C, OUTLINES SECTION. Tube requires octal socket. Filament volts (dc), 2.0; amperes, 0.24. Pypical operation as push-pull class A₁ ampli-TINUED type listed for reference only.

PENTAGRID CONVERTER

length, 1.75 inches; seated height, 1.5 inches; diameter, 6.4 inch. Tube requires subminiature eight-contact socket. Filament volts (dc), 1.25; amperes, 0.04. Typical operation as converter: plate volts and grids-No.2-and-No.4 supply Subminiature type used in small, compact, battery-operated receivers for the standard AM broadcast band. Maximum dimensions: over-all volts, 67.5 max; grids-No.2-and-No.4 resistor,

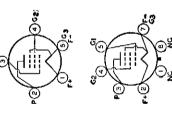
20000 ohms; grid-No.3 volts, 0; grid-No.1 resistor, 0.1 megohm; plate resistance (approx.), 0.4 megohm; conversion transconductance, 150 µmhos; total cathode ma., 2.5 (4 max); plate ma., 1; grids-No.2-and-No.4 ma., 1.5; grid-No.1 µa., 70. This is a DISCONTINUED type listed for reference only.

POWER PENTODE

operated receivers. Outline 27, OUTLINES SECTION. Tube requires five-contact socket. Flianent volts (dc), 2.0; amperes, 0.12. Type 1F4 is similar electrically to type 1F6-G. Type 1F4 is a DISCONTINUED type listed for ref-Glass type used in output stage of battery. erence only.

POWER PENTODE

Glass octal type used in output stage of battery-operated receivers. Outline 26, OUT-LINES SECTION. Tube requires octal socket. Filament volts (dc), 2.0; amperes, 0.12. Typical operation as class A₁ amplifier; plate and grid-No.2 (screen-grid) volts, 135 (180 max); grid-No.1 volts, -4.5; plate ma., 8; grid-No.2 ma., 2.4; cathode resistor, 432 ohms; output watts, 0.31. This is a DISCONTINUED type listed for reference only.



SHARP-CUTOFF PENTODE TWIN DIODE-

= Technical Data =

Tube requires six-contact socket. Filament volts (dc), 2.6; amperes, 0.06. Typical operation of pentode unit as class A₁ amplifier: plate volts, grid-No.1 volts, -1.5; plate ma., 2.2; grid-No.2 ma., 0.7. This is a DISCONTINUED type Glass type used as combined detector, amplifier, and ave tube in battery-operated receivers. Outline 23, OUTLINES SECTION. 180 max; grid-No.2 (screen-grid) volts, 67.5 max isted for reference only.

SHARP-CUTOFF PENTODE TWIN DIODE-

amplifier, and ave tube in battery-operated receivers. Outline 23, OUTLINES SECTION, Tube requires octal socket, Filament volts (dc), 1F6 except for interelectrode capacitances. Type 1F7G is a DISCONTINUED type listed for Glass octal type used as combined detector, 2.0; amperes, 0.06. Similar electrically to type reference only.

HALF-WAVE VACUUM RECTIFIER

as the rectifier in a high-voltage, rf-operated power supply or as a rectifier of Glass octal type used in highvoltage, low-current applications such

vision scanning systems. Outline 15B, OUTLINES SECTION. This type may be supplied with pins 1, 4, and/or 6 omitted. Tube requires octal socket and may be mounted in any position. Except for physical dimensions, this type is identical with high-voltage pulses produced in teleglass octal type 1B3-GT.

MEDIUM-MU TRIODE

receivers as detector or voltage amplifier, Out-line 14C, OUTLINES SECTION Tube requires 0.05. Typical operation and characteristics as class A₁ amplifier: plate volts, 90 (100 $m\alpha$); grid volts, -6; plate ma., 2.3; plate resistance, Glass octal type used in battery-operated octal socket. Filament volts (dc), 1.4; amperes, 10700 ohms; amplification factor, 8.8; trans-conductance, 825 µmhos. This is a DISCON-

POWER PENTODE

battery-operated receivers. Outline 26, OUT-LINES SECTION. Tube requires octal socket. Filament volts (dc), 20; amperes, 0.12. Typical volts, -13.5; plate ma., 9.7; output watts, 0.55. This is a DISCONTINUED type listed for operation as class A, amplifier: plate and grid-No.2 (screen-grid) volts, 185 max; grid-No.1 Glass octal type used in output stage of reference only.

1F/G



TINUED type listed for reference only.



HIGH-MU TWIN POWER TRIODE

Glass octal type used in output stage of battery-operated receivers. Outline 14C, OUT-LINES SECTION. Tube requires octal socket. Filament volts (dc), 1.4; amperes, 0.1. Typical operation as class B amplifier: plate volts, 90 $(110\ max)$; de grid volts, 0; peak af grid-to-grid volts, 48; effective grid-circuit impedance per unit, 2530 ohms; plate ma. (zero signal), 2, (maximum signal), 11; peak grid ma. per unit, 6; output watta (approx.), 0.35. This is a DISCOM-TINUED type listed for reference only.

MEDIUM-MU TRIODE

Glass octal type used as detector or voltage conductance, 900 µmhos; plate ma., 3.1. This is a DISCONTINUED type listed for reference only. amplifier in battery-operated receivers. Outline 22, OUTLINES SECTION. Tube requires octal socket. Filament volts (dc), 2.0; amperes, 0.06. Typical operation as class A₁ amplifier: plate volts, 180 max; grid volts, -13.5; amplification factor, 9.3; plate resistance, 10300 ohms; trans-

DIODE-HIGH-MU TRIODE

and amplifier in battery-operated receivers. Outline 15A, OUTLINES SECTION. Tube requires 240000 ohms; amplification factor, 65; transconductance, 275 µmhos. Diode is located at negative end of filament. This type is used princed. Characteristics of triode unit as class A₁ Glass octal type used as combined detector octal socket. Filament volts (dc), 1.4; amperes, amplifier: plate volts, $90 \ (110 \ max)$; grid volts, 0; plate ma., 0.15; plate resistance (approx.) cipally for renewal purposes. 0.05

TWIN DIODE-MEDIUM-MU TRIODE

Tube requires octal socket. Filament volts (dc) Cs. Ganperes, 0.06. Type 1H6-G is similar electrically to type 1B5/2Ss. Type 1H6G is a DISCONTINUED type listed for reference only. amplifier, and ave tube in battery-operated receivers. Outline 22, OUTLINES SECTION, Glass octal type used as combined detector,

HALF-WAVE VACUUM RECTIFIER

physical dimensions, this type is identical with glass octal type 1K3. white television receivers. Outline 15D, Glass octal type used as a rectifier of high-voltage pulses produced in the scanning systems of black-and-OUTLINES SECTION. Except for

POWER PENTODE

battery-operated receivers. Outline 26, OUT-LINES SECTION. Tube requires octal socket. Filament volts (dc), 2.0; amperes, 0.12. Typical -16.5; plate ma., 7.6; grid-No.2 ma., 2.0; plate resistance, 105000 ohms; load resistance, 13500 ohms; output watta, 0.45. This is a DISCON-Glass octal type used in output stage of operation as class A₁ amplifier: plate and grid-No-2(screen-grid) volts, 135 maz; grid-No.1 volts, TINUED type listed for reference only.

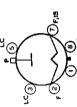
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HIGH-MU TWIN POWER TRIODE

- Technical Data

line 22; type 1J6GT, Outline 14E, OUTLINES Glass octal types used in output stage of ment volts (dc), 2.0; amperes, 0.24. Typical operation as class B power amplifier: plate volts. SECTION, Tubes require octal socket. Fila-135 max; peak plate ma. per plate, 50 max; grid volts, 0; zero-signal plate ma. per plate,

 \bar{b}_i effective plate-to-plate load resistance, 10000 ohms; average input watts, 0.17; output watts, 2.1. These are DISCONTINUED types listed for



reference only

fier of high-voltage pulses produced in Glass octal type used as a rectithe scanning systems of black-andwhite television receivers. Type 1K3 HALF-WAVE VACUUM RECTIFIER

mounted in any position. Plate connection is cap at top of bulb. Socket terminals 1, 3, 4, 5, 6, and 8 may be connected to socket terminal 7 or to a corona shield which is connected to socket terminal 7. Socket terminals 4 and 6 may be used as tie points for components at or near filament potential. Outline 15B, OUTLINES SECTION. For high-voltage considerations, see type 1B3-GT. requires an octal socket and may be

volta ampere	pf 1 48 malter
1.25	1.6
Filament Voltage (Ac/dc).	DIRECT INTERRILECTRODE CAPACITANCE (Approx.): Plate to Filament and Internal Shield

* Under no circumstances should the filament voltage be less than 1.05 volts or greater than 1.45 volts.

PULSED RECTIFIER

For operation in a 525-line, 30-frame bystem Maximum Ratings, (Design-Maximum Values):

50 max 0.5 max 26000 max PRAK INVERSE PLATE VOLTAGES* PEAK PLATE CURRENT..... AVERAGE PLATE CURRENT

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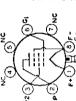
*The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a \$525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

The dc component must not exceed 22000 volta. 22 Tube Voltage Drop for plate current of 7 ma......... Characteristics, Instantaneous Value:

PENTAGRID CONVERTER

Miniature type used in low-drain battery-operated receivers. Outline 7B, OUTLINES SECTION, Tube requires miniature seven-con-No.2 volts, 90 (110 max); grids-No.3-and-No.5 supply volts, 110 max; grids-No.3-and-No.5 tact socket and may be mounted in any posi-Pypical operation as converter: plate and gridtion, Filament volts (dc), 1.4; amperes,

resistor, 0.2 megohm; plate resistance (approx.), 0.65 megohm; plate ma., 0.5; grids-No.3-and-No.5 ma., 0.6; grid-No.2 ma., 1.2; grid-No.1 ma., 0.035; total cathode ma., 2.35 (4 max); conversion transconvolts, 45 (65 maz); grid-No.4 volts, 0; grid-No.1 ductance, 300 gmhos. This type is used principally for renewal purposes



POWER PENTODE

Filament volts (dc), 1.4; amperes, 0.05. For electrical characteristics and typical operation, refer to glass-octal type 1A5-GT. Type 1.1A4 is a DISCONTINUED typelisted for reference only. Glass lock-in type used in output stage of battery-operated receivers. Outline 13A, OUT-LINES SECTION. Tube requires lock-in socket.

PENTAGRID CONVERTER

Glass lock-in type used in battery-operated receivers. Outline 18A, OUTLINES SECTION. Tube requires lock-in socket. Filament volts (dc), 1.4; amperes, 0.05. Typical operation as converter is the same as for type 1A7-GT exeept that grid-No.2 volts is 65 max, total cathode ma. is 4.0 max, plate resistance is 0.75 megohm, and conversion transconductance for a grid-No.4 bias of -8 volts is 10 µmbos. This type is used principally for renewal purposes.

POWER PENTODE

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battery-operated receivers. Outline 13A, OUT-LINES SECTION. Tube requires lock-in socket. Filament volta (dc), 1.4; amperes, 0.05. For elec-Glass lock-in type used in output stage of trical characteristics, refer to pentode unit of glass-octal type 1D8-GT. Type 1LB4 is used principally for renewal purposes.

SHARP-CUTOFF PENTODE

greater than 1 megohm; transconductance, 776 µmhos; plate ma., 1.15; grid-No.2 ma., 0.3, This is a DISCONTINUED type listed for reference Filament volts (dc), 1.4; amperes, 0.05. Typical operation as class A1 amplifier: plate volts, 90 (110 max); grid-No.2 (screen-grid) volts, 45 max; in battery-operated receivers, Outline 13A, OUT-LINES SECTION. Tube requires lock-in socket. Glass lock-in type used as rf or if amplifier grid-No.1 volts, 0; plate resistance (approx.),

PENTAGRID CONVERTER

Glass lock-in type used in battery-operated receivers. Outline 13A, OUTLINES SECTION. Tube requires lock-in socket. Filament volts converter: plate volts, 90 (110 max); grids-No.8-and-No.5 volts, 86 (45 max); grids-No.2 volts, 45; grid-No.1 volts, 01 plate resistance, 0.65 meg-ohm; plate ma., 0.75; grids-No.8-and-No.5 max. (dc), 1.4; amperes, 0.05. Typical operation as 0.70; grid-No.2 ma., 1.4; total cathode ma., 2.9;

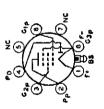
conversion transconductance (zero bias), 275 µmhos. This type is used principally for renewal purposes.

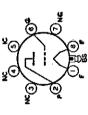
DIODE -- SHARP-CUTOFF PENTODE

Tube requires lock-in socket. Filament volts (dc), 1.4; amperes, 0.05. Characteristics of pentor and at voltage amplifier in battery-operated receivers. Outline 18A, OUTLINES SECTION. tode unit: plate volts, 90 (110 maz); grid-No.2 volts, 45; grid-No.1 volts, 0; plate ma., 0.6; ohm; transconductance, 575 mmhos. This is a DISCONTINUED type listed for reference grid-No.2 ma., 0.1; plate resistance, 0.75 meg-Glass lock-in type used as combined detec-

MEDIUM-MU TRIODE

age amplifier in battery-operated receivers. Outline 13A, OUTLINES SECTION. Tube requires tock-in socket. Filament volts (dc), 1.4; amperes, plate volts, 90 (110 max); grid volts, -3; plate ma., 1.4; plate resistance, 19000 ohms; trans-Glass lock-in type used as detector or volt-9,05. Typical operation as class At amplifier: conductance, 760 µmhos; amplification factor 14.5. This type is used principally for renews





Characteristics, Instantaneous Value:

REMOTE-CUTOFF PENTODE

Lock-in type used as rf or if amplifier in battery-operated receivers. Outline 13A, OUT-LINES SECTION. Tuberequires lock-in socket. operation as class A1 amplifier: plate volts, 90 (110 max); grid-No.2 volts, 45 (110 max); grid-No.2 volts, 45 (110 max); gridthan 1 megohm; transconductance, 800 µmhos; plate ma., 1.7; grid-No.2 ma., 0.4. This type is Filament volts (dc), 1.4; amperes, 0.05. Typical No.1 volts, 0; plate resistance (approx.), greater used principally for renewal purposes.

DIODE-HIGH-MU TRIODE

Glass lock-in type used as combined detector and amplifier in battery-operated receivers. Outline 18A, OUTLINES SECTION. Tube reamperes, 0.05. For electrical characteristics, refer to glass-octal type 1H6GT. Type 1LH4 is used principally for renewal purposes. quires lock-in socket. Filament volts (dc), 1.4;

SHARP-CUTOFF PENTODE

Glass lock-in type used as rf or if amplifier in battery-operated receivers. Outline 13A, OUT-LINES SECTION. Tube requires lock-in socket. Filament volts (dc), 1.4; amperes, 0.05. Typical operation as class A1 amplifier: plate and grid-No.2(screen-grid) volts, 90 (110 max); grid-No.1 conductance, 800 µmhos. This type is used volts, 0; plate ma., 1.6; grid-No.2 ma., 0.35; plate resistance (approx.), 1.1 megohms; transprincipally for renewal purposes.

HALF-WAVE VACUUM RECTIFIER

voltage rectifier in television receivers. imum diameter, 1-9/16 inches. Tube Glass octal type used as high-Maximum over-alllength, 3-9/16 inches; maximum seated length, 3 inches; max-(3) F, IS

requires octal socket and may be operated in any position. For installation and application considerations, refer to type 1B3GT.

FILAMENT VOLTAGE (AC)	1.25	VOLUE
FILAMENT CURRENT	0.5	ampere
DIRECT INTERESTRODE CAFACITANCE: Plate to Filament and Internal Shield.	1.4	ă
PULSED RECTIFIER		
For operation in a 525-line, 30-frame system		
Maximum Ratinds. (Desion-Maximum Values):		

28000 max PEAK INVERSE PLATE VOLTAGEOF........ PEAK PLATE CURRENT..... AVERAGE PLATE CURRENT.

* Under no circumstances should the filament voltage be less than 1.05 volts or greater than 1.45 volts.

"The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a F25-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

"The dc component must not exceed 24000 volts. Tube Voltage Drop for plate current of 7 ma......

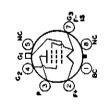
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SHARP-CUTOFF PENTODE

battery-operated receivers. Outline 15Å, OUT-LINES SECTION. Tuberequires octal socket. Filament volts (dc), 1.4; amperes, 0.05, Charac-Glass octal type used as rf or if amplifier in conductance, 750 μ mhos; plate ma., 1.2; grid-No.2 ma., 0.3. This type is used principally for teristics as class A1 amplifier: plate and grid-No.2 volts, 90 (110 max); grid-No.1 volts, 0; plate resistance (approx.), 1.5 megohms; transrenewal purposes.



DIODE-POWER PENTODE

grid-No.2 (screen-grid) volts, 90 (110 maz); grid-No.1 volts, -4.5; plate ma., 3.1; grid-No.2 receivers. Maximum over-all length, 4 inches; maximum diameter, 1-3/16 inches. Filament tor and power output tube in battery-operated volts (dc), 1.4; amperes, 0.05. Typical operation of pentode unit as class A1 amplifier: plate and Glass octs! type used as combined detecma. (zero-signal), 0.6; plate resistance

0.8 megohm; transconductance, 800 µmhos; load resistance, 25000 ohms; output watts, 0.1. This is a DISCONTINUED type listed for reference only.

REMOTE-CUTOFF PENTODE

(approx.), 0.8 megohm; transconductance, 750 pmhos; plate ma., 2.3; grid-No.2 ma., 0.7. This is a DISCONTINUED type listed for reference Glass octal type used as rf or if amplifier in battery-operated receivers. Outline 15Å, OUT-LINES SECTION. Tube requires octal socket. Filament volts (dc), 1.4; amperes, 0.05. Typical (110 max); grid-No.2 (screen-grid) volts, 90 (110 max); grid-No.1 volts, 0; plate resistance operation as class A1 amplifier: plate volts, 90



Glass octal type used in the output stage trical characteristics and ratings, refer to type ofbattery-operated receivers. Outline 14C, OUT-LINES SECTION. Tube requires octal socket. Filament volts (dc), 1.4; amperes, 0.1. For elec-BEAM POWER TUBE

Type 1Q5-GT is a DISCONTINUED type for 8Q5-GT with parallel filament arrangement.

PENTAGRID CONVERTER

Miniature type used in lightweight, por-table, compact, battery-operated receivers. Out-tine 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket. Characteristics as converter with separate excitation: plate volts, 67.5 (90 max); grids-No.2 and No.4 volts, 67.5 max; grid-No.3 volts, 0; rms grid-No.1 volts, 25; grid-No.1 resistor, 0.1 megohm; plate re-



sistance (approx.), 0.4 megohm; conversion transconductance, 280 µmhos; plate ma., 1.4; grids-No.2 and No.4 ma., 3.5; grid-No.1 µa, 250; total cathode ma., 5.2. This type is used principally for renewal purposes.

POWER PENTODE

miniature seven-contact socket and may be mounted in any position. For ratings and typical operation, refer to type 384 with parallel lightweight, compact, portable, battery-operated equipment. Types 1S4 and 3S4 are identi-OUTLINES SECTION. Type 184 requires filament arrangement. Filament volts (dc), 1.4; amperes, 0.1. This type is used principally for cal except for filament arrangement. Outline TB, Miniature type used in output stage renewal purposes.



SHARP-CUTOFF PENTODE DIODE-

table, compact, battery-operated receivers as combined detector and af voltage amplifier. Outminiature seven-contact socket. Filament volts (dc), 1.4; amperes, 0.05. For electrical characteristics, refer to type IU5. Type IS5 is used Miniature type used in lightweight, porline 7B, OUTLINES SECTION. Tube requires principally for renewal purposes.

REMOTE-CUTOFF PENTODE

table, compact, battery-operated receivers as fro frampliner, Outline TB, OUTLINES SEC-TION. Tube requires miniature seven-contact socket. Filament volts (dc), 1.4; amperes, 0.05. Miniature type used in lightweight, por-Characteristics as class A₁ amplifier: plate and transconductance, 875 µmhos; plate ma., 3.4; grid-No.2 ma., 1.5. This type is used princigrid-No.2 volts, 67.5 (90 max); grid-No.1 volts, 0; plate resistance (approx.), 0.25 megolun; pally for renewal purposes.

BEAM POWER TUBE

LINES SECTION. Tube requires octal socket. Filament volts (de), 1.4; amperes, 0.05. Typical Glass octal type used in output stage of operation as class A₁ amplifier: plate and gridpeak af grid-No.1 volts, 6; plate ma., 6.5; grid-No.2 volts, 90 (110 max); grid-No.1 volts, -6; No.2 ma. (zero-signal), 0.8; grid-No.2

megohm; transconductance, 1150 µmhos; load resistance, 14000 ohms; total harmonic distortion, 7.5 per cent; output watta, 0.17. This is a DISCONTINUED type listed for reference only. (maximum signal), 1.5; plate resistance, 0.25

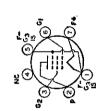
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DIODE-SHARP-CUTOFF PENTODE

length, 1.75 inches; seated height, 1.5 inches; diameter, 0.4 inch. Tube requires subminiature eight-contact socket. Filament volts (dc), 1.25; Subminiature type used as combined detector and audio amplifier in small, compact, battery-operated receivers for the standard AM broadcast band. Maximum dimensions: over-all amperes, 0.04. Filament voltage should never

exceed 1.6 volts. Typical operation of pentode transitions and grid-No.2 volts, 67.5 mars; grid-No.2 volts, 1.6 mars; grid-No.2 volts, 1.6 mars; grid-No.2 volts, 1.6 mars; grid-No.2 volts, 1.6 mars. 1.6; grid-No.2 ma., 1.4; total cathode ma., 2.0 mars. Maximum diode plate ma., 0.26. This is a DISCONTINUED type listed for reference only.

Miniature type used as ri or if amplifier in stages not controlled by ave in lightweight, compact, portable, battery-operated equipment. Outline 7B, OUTLINES SECTION. Tube requires ministure seven-contact socket, Filament volts (dc), 1.4; amperes, 0.05. Characteristics as class A amplifier: plate and grid-No. 2 volts, 90 (120 max); grid-No.1 volts, 0; plate resistance (approx.), 1 megohm; transconduct-



ance, 900 µmhos; plate ma., 1.6; grid-No.2 ma., 0.5. This type is used principally for renewal purposes.

DIODE—SHARP-CUTOFF PENTODE

pact, portable, battery-operated receivers as combined detector and at voltage amplifier. Outline 7B, OUTLINES SECTION, Tube requires miniature seven-contact socket. Filament volts (dc), 1.4; amperes, 0.05. Characteristics of pentode unit as class A₁ amplifier: plate and grid-No.2 volts, 67.5 (100 max); grid-No.1 volts, Miniature type used in lightweight, com-

plate resistance (approx.), 0.6 megohm;
 transconductance, 625 μmhos; plate ma., 1.6; grid-No.2 ma., 0.4. Maximum diode plate ma., 0.28 max.
 This type is used principally for renewal purposes.

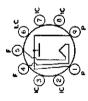
HALF-WAVE VACUUM RECTIFIER

4-3/16 inches; seated height, 3-9/16 inches; disameter, 1-9/16 inches. Tube requires four-conreceivers. Maximum dimensions: over-all length, peres, 0.3. Maximum ratings as half-wave rectifier: peak inverse plate volts, 1000; peak plate ma., 270; peak heater-cathode voits, 500; de output ma., 45. This type is used principally Glass type used in ac/dc or automobile socket. Heater volts (ac/dc), 6.3; amfor renewal purposes.



HALF-WAVE VACUUM RECTIFIER

Miniature type used in high-voltage, low-current applications such as erated voltage-doubling power supplies for kinescopes. The very low power the rectifier in high-voltage, pulse-op-



required by the filament permits the use of a rectifier transformer having small rize and light weight.

FILAMENT VOLTAGE (AC)	0.625	volt
FILAMENT CURRENT.	0.3	ampere
Direct Interejectrode Capacitance:		
Plate to Filament (Approx.)	8.0	Ħ
■ Under no circumstances should the filament voltage be less than 0,525 volt or greater than 0,725 volt.	ater than 0.725 v	الد مالد

PULSED RECTIFIER

For operation in a 525-line, 30-frame system Č

8250 max	11 max	30
PEAK INVERSE PLATE VOLTAGE*	PEAK PLATE CURRENT.	A VERPACE DI AFE CITEDENE

ng Tug 88

• The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

The dc component must not exceed 7000 volts.

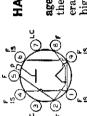
= Technical Data

NSTALLATION AND APPLICATION

have adequate insulation between its filament and plate terminals to withstand the maximum peak inverse plate voltage. To provide the required insulation in to remove the center shield. In addition, socket terminals 2, 3, 7, and 8 shall not be used. Socket terminal 6 may be used as a tie point for components at or near filament potential. Outline 8D, OUTLINES SECTION. position. The socket should be made of material having low leakage and should miniaturenine-contact sockets designed with a cylindrical center shield, it is necessary Type IV2 requires a miniature nine-contact socket and may be mounted in any

The filament windings on the pulse transformer should be adjusted to provide the rated voltage under average line-voltage conditions. When the filament voltage is measured, it is recommended that an rms voltmeter of the thermal type be used. The meter and its leads must be insulated to withstand 15000 volts and the stray The filament is of the coated type and is designed for operation at 0.625 volt. capacitances to ground should be minimized.

should be taken to prevent coming in contact with these high voltages. Particular care against fatal shock should be taken in measuring the filament voltage in those circuits where the filament is not grounded. Precautions must include safeguards The high voltages at which the IV2 is operated are very dangerous. Great care which definitely eliminate all hazards to personnel.



HALF-WAVE VACUUM RECTIFIER

age, low-current applications such as Miniature types used in high-voltthe rectifier in a high-voltage, rf-operated powersupply, or as the rectifier of high-voltage pulses produced in tele-

ature nine-contact socket and may be mounted in any position. Socket terminals 3 and 7 may be used as tie points for components at or near filament potential. For high-voltage considerations, refer to type 1B3-GT. Type 1X2-A is used principally vision scanning systems Outline 9A, OUTLINES SECTION. Tubes require minfor renewal purposes.

volts ampere	Ъį
1,25 0.2	1.0
FILAMENT VOLTAGE (AC).	Direct Interelectrode Capacitance: Plate to Filament and Internal Shield (Approx.)

* Under no circumstances should the filament voltage be less than 1.05 volts or greater than 1.45 volts.

PULSED RECTIFIER

For operation in a 525-line, 30-frame system

	1 X 2-A	1X2-A IXZ-B	þ		
	Design-Center Design-Maximum	Design $-M$	axima	8	
Maximum Ratings:	Values	Values	697		
PRAK INVERSE PLATE VOLTAGE	20000tmax	22000 max	max	volts	
PEAK PLATE CURRENT.	45 max	45	45 max	ma	
AVERAGE PLATE CURRENT	0,5 max	0.5	0.5 max	ğ	
Characteristics, Instantaneous Value:					
Tube Voltage Drop for plate current of 7 ma		100		volta	
† Absolute Maximum. Under no circumstances should this absolute value be exceeded.	e value be exce	ded.			
# Except as noted.					
■ The dc component must not exceed 16000 volts for 1X2-A, 18000 volts for 1X2-B.	100 volts for 1X	2-B			

POWER TRIODE

ceivers and amplifiers. Outline 28, OUTLINES SECTION. Tube requires four-contact socket, Filament volts (ac/dc), 2.5; amperes, 2.5. Typical operation as class A₁ amplifier: plate voits, amplification factor, 4.2; load resistance, 800 ohms; transconductance, 5250 µmhos; plate dissipation, 15 mux watts; load resistance, 2500 Glass type used in output stage of radio re-250 (300 max); grid volts, -45; plate ma., 60;

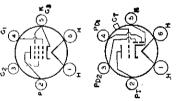
ohms; power output, 3.5 watts. Typical operation as push-pull class AB; amplifier (values are for two tubes); plate supply volts, 300; cathode-bias resistor, 780 ohms; peak af grid-to-grid volts, 156; zerosignal plate ma., 80; maximum-signal plate ma., 190; effective load resistance (plate-to-plate), 5000 ohms; power output, 10 watts. This type is used principally for renewal purposes.

POWER PENTODE

Glass type used in output stage of ac-operated receivers. Outline 27, OUTLINES SEC.
TION. Tube requires six-contact socket, Except
for its beater rating (2.5 volts ac/dc; 1.75
amperee), the 2A5 has electrical characteristics identical with type 6F6. Type 2A5 is a DIS-CONTINUED type listed for reference only.

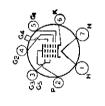
TWIN DIODE—HIGH-MU TRIODE

Glass type used in ac-operated receivers chiefly as a combined detector, amplifier, and ave tube. Outline 24B, OUTLINES SECTION. Tube requires six-contact socket. Except for its heater rating (2.5 volts ac/de; 0.8 ampere), and within its 250-volt maximum plate rating. the 246 has electrical characteristics identical with type 68Q7. Type 2A6 is a DISCONTIN-UED type listed for reference only.



PENTAGRID CONVERTER

Glass type used in ac-operated receivers. Outline 24B, OUTLINES SECTION. Tube rediameter) socket. Except for its heater rating (2.5 volts ac/de; 0.8 ampere) and its interelecteristics identical with type 6A8. Complete shielding of this tube is generally necessary. Type 2A7 is a DISCONTINUED type listed quires small seven-contact (0.75-inch, pin-circle trode capacitances, the 2A7 has electrical characfor reference only.



MEDIUM-MU TRIODE

cillator in uhf television receivers em-Miniature types used as local osploying series-connected heater strings. Outline 7A, OUTLINES SECTION

2AF4B

2AF4A

3AF4A, 6AF4A Related types:



Heater volts (ac/dc), 2.35; amperes, 0.6; warm-up time (average), 11 seconds. Type 2AF4-B only, maximum rating tive with respect to the cathode, the dc component of the heater-cathode voltage must not exceed 100 volts. Typical operation of 2AF4-B as oscillator at 1000 Mc: plate ma., 17.5; grid µa (approx.), 700. Except for heater ratings noted, these (design maximum), peak heater-cathode volts, 180 max. When the heater is posiypes are identical with miniature type 6AF4-A. Type 2AF4-A is a DISCONTIN-UED type listed for reference only.

HALF-WAVE VACUUM RECTIFIER

high voltage to the anode of picture to supply tubes in television receivers. Outline 16A, OUTLINES SECTION. Tuberequires 12-contact socket and may be Duodecar type used

වු

mounted in any position. Socket terminals 2, 3, 5, 6, 7, 8, 9, and 11 should not be used as tie points; terminals 4 and 10 may be used as tie points for components at or near cathode potential. For high-voltage and X-ray safety considerations, refer to type 1B3-GT. Heater volts (ac/dc), 2.5; amperes, 0.3.

Technical Data

For operation in a 525-line, 30-frame system PULSED RECTIFIER

Maximum Ratings, (Design-Maximum Values): Prax Inverses Plate Voltage" Prax Plate Current Average Plate Current	80000°max 80 max 1.5 max	volts ma ma	
Characteristics, Instantaneous Value: Tube Voltage Drop for plate current of 7 ma	100 tal scanning cy icroseconds.	volts cle. In a	

HALF-WAVE VACUUM RECTIFIER

high voltage to the anode of picture tubes in television receivers. Outline 16B, OUTLINES SECTION. Tube Duodecar type used to supply twelve-contact duodecar **၁** (<u>၅</u>)

socket and may be mounted in any position. Socket terminals 4, 7, and 10 may be used as tie points for components at or near heater potential. For high-voltage and X-ray safety considerations, refer to type 1B3-GT. Heater volts (ac/dc), 2.5; requires amperes, 0.33.

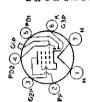
PULSED RECTIFIER

For operation in a 525-line, 30-frame system

	30000 mag	-	T.C 1114	
Maximum Rafings, (Design-Maximum Values):	PEAK INVERSE PLATE VOLTAGE ²	PEAK PLATE CURRENT,	AVERAGE PLATE CURRENT	

volta The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a \$25-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

* The de component must not exceed 24000 volts. Tube Voltage Drop for plate current of 7 ma...... Characteristics, Instantaneous Value:



REMOTE-CUTOFF PENTODE TWIN DIODE-

Glass type used as combined detector, ave tube, and amplifier. Outline 24B, OUTLINES SECTION. Tube requires small seven-contact (0.75-inch, pin-circle diameter) socket. Except has electrical characteristics identical with type for its heater rating (2.5 volts ac/dc; 0.8 ampere) and its interelectrode capacitances, the 2B7 6B8-G. Type 2B7 is a DISCONTINUED type isted for reference only.



MEDIUM-MU TRIODE

are identical with miniature types 6BN4 and 6BN4A, respectively. Type 2BN4 is a DISCONTINUED type listed for reference only. Type 2BN4-A is used principally for renewal television tuners employing series-connected heater strings. Outline 7B, OUTLINES SEC-TION. Heater volts (ac /dc), \$BN \$1:2.3, \$BN \$4-A: Miniature types used as rf amplifier in vhf 2.35; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater rating, these types purposes.



2BN4

HIGH-MU TRIODE

seconds. Except for heater ratings, this tuners of television and FM receivers employing series-connected heater strings. Outline 1, OUTLINES SEC-TION. Heater volts (ac/dc), 2.1; amperes, 0.45; warm-up time (average), 8 Nuvistor type used as a groundedcathode, neutralized rf amplifier in vhf type is identical with nuvistor type 6CW4.

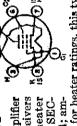
20₩4 Related hypes:

6CW4, 13CW4

SHARP-CUTOFF TETRODE

3CYS, 4CYS, 6CYS **2CY5** Related types:

in vhi tuners of television receivers employing series-connected heater Miniature type used as rf amplifier strings, Outline 7B, OUTLINES SEC-TION. Heater volts (ac/dc), 2.4; am-



peres, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6CX5.

HIGH-MU TRIODE

Related type:

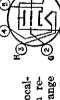
Heater volts (ac/dc), 2.1; amperes, employing series-connected heater cathode, neutralized rf amplifier in vhf tuners of television and FM receivers strings. Because of its cutoff characteristics, the 2DS4 is used in circuits to reduce cross-modulation distortion. Outline 1, OUTLINES SECTION

0.45; warm-up time (average), 8 seconds. Except for heater ratings, this type is identical with nuvistor type 6DS4.

MEDIUM-MU TRIODE

2DV4 telested types

type is identical with nuvistor type 6DV4. Nuvistor type used at frequencies up to 1000 megacycles in uhf oscillator onds. Except for heater ratings, this rtages of television receivers employng series-connected heater strings. Outline 1, OUTLINES SECTION. Heater volts (ac/dc), 2.1; amperes, 0.45; warm-up time (average), 8 sec-



Miniature type used as a local-MEDIUM-MU TRIODE

> **2DZ4** Related lypes: 3DZ4, 6DZ4

ploying series-connected heater strings. Outline 7A, OUTLINES SECTION. Heater volts (ac/dc), ceivers covering the frequency range oscillator tube in uhf television refrom 470 to 890 megacycles and em-

warm-up time (average), 11 seconds. Peak heater-cathode volts, 180 max (the de Except for heater and heater-cathode ratings, this type is identical with miniature 2.35; amperes, 0.6; component must not exceed 100 volts when heater is positive with respect to cathode). type 6DZ4

100

INDEX=LARGE LUG

Nuvistor type used as grounded-

INDEX*LARGE LUG •*SHORT PIN; IC-DO NOT USE

INDEX*LARGE LUG

= Technical Data ==

ELECTRON-RAY TUBE

all length, 4-3/16 inches; seated height, 8-9/16 inches: diameter, 1-9/16 inches. Tuberequiressix-contact socket. Except for its heater rating (2.5 Glass type with triode unit used to indicate visually by means of a fluorescent target the effects dio receiver tuning. Maximum dimensions: overof a change in a controlling voltage. It is used as a convenient means of indicating accurate ra-

Related types 6ES **2E5**

volts ac/dc; 0.8 ampere), the 2E5 has electrical volts ac/dc; 0.8 ampere), the 2E5 has electrical with type 6E5. Type 2E5 is a DISCONTINUED typelisted for reference only.

TWIN DIODE

detector in television receivers. Outline 7B, OUTLINES SECTION. Tube requires ministure seven-contact socket and may be mounted in any position, Heater volts (ac/dc), 2.1; amperes, 0.45; warm-up time (average), 11 seconds. Maximum ratings (design maximum) as balfwave rectifier: de output ma. per plate, 5 maz; peak heater-cathode volts, 200 maz. When the Miniature type used as a horizontal phase

heater is positive with respect to cathode, the dc component of the heater-cathode voltage must not exceed 100 volts. Type 2EN5 is used principally for renewal purposes.

SHARP-CUTOFF TRIODE

Miniature type with frame grid used in vhf tuners of television re-OUTLINES SECTION. Heater volts (ac/dc), 2.3; amperes, 0.6. Except for heater ratings, this type is identical with mini-Outline 7B. ature type 6ER5. ceivers.

Rolefed types: 3ERS, 6ERS

SHARP-CUTOFF TRIODE

2FH5 Related types: 3PHS, 6PH5

Miniature type used as an rf amplifier in whf tuners of television receivers employing series-connected heater strings. Outline 7B, OUTLINES SEC-TION. Heater volts (ac/dc), 2.35; am-

peres, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6FH5,

BEAM HEXODE

Miniature type used as rf-amplifier tube in vhf television receivers employing series-connected heater strings. Outline 7B, OUTLINES SEC-

0.6; warm-up time (average), 11 seconds. Except for heater ratings, this TION. Heater volts (ac/dc), 2.4; amtype is identical with miniature type 6FS5. peres.

Miniature type with frame grid used as grounded-cathode rf-amplifier tube in whi tuners of television receivers employing series-connected **HIGH-MU TRIODE**

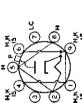
2GK5 Related hypes: 3GKS, 6GKS

SECTION. Heater volts (ac/dc), 2.3; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6GK5. heaterstrings. Outline 7B, OUTLINES



HALF-WAVE VACUUM RECTIFIER

Miniature type used as rectifier of high-voltage pulses produced in scanning systems of colortelevision receivers. Outline 9A, OUTLINES SECTION. Tube requires miniature 9-contact socket and may be mounted in any position. Socket terminals 3 and 7 may be connected to 0.22. Maximum ratings as pulsed rectifier in 525line, 30-frame system: peak inverse plate volts, the heater. Heater volts (ac), 3,15; amperes



18000 maz; peak plate ma., 80 maz; average plate ma., 1.5 maz. For high-voltage considerations, see type 1B3-GT. Type 3A2 is used principally for renewal purposes.

HALF-WAVE VACUUM RECTIFIER

of high-voltage pulses produced in the Glass octal type used as rectifier scanning systems of color television receivers. Outline 15D, OUTLINES SECTION. Tube requires octal socket

and may be mounted in any position. Socket terminals 1, 3 4, 5, 6, and 8 may be connected to socket terminal 7. Socket terminals 4 and 6 may be used as tie points for components at or near heater potential. For high-voltage considerations, see type 1B3-GT.

volts ampere	pf .65 volts.
8.15 0.22	1.6 reater than 3.
	Plate to Heater, Cathode, and Internal Shield. Under no circumstances should the heater voltage be less than 2.65 volts or greater than 3.65 volts.
A CAMPAGE AND A	and Internal Shield
BEATER VOLTAGE (AC) BEATER CURRENT DIRECT INTEREST	Plate to Heater, Cathode, and Internal Shield. Under no circumstances should the heater voltage be less than 2.65 volta c

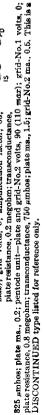
For operation in a 525-line, 30-frame system Maximum Rafings, (Design-Maximum Values):

\$0000 max PEAK INVERSE PLATE VOLTAGE". CURRENT

8 B The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a \$25-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds. 88 max 1.7 max AVERAGE PLATE CURRENT.

DIODE—TRIODE—PENTODE

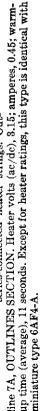
0.1 (parallel), 0.05 (series). Typical operation as ef amplifier, and rf amplifier in battery-operated receivers. Maximum over-all length, 3-7/16 inches; maximum diameter, 1-5/16 inches. Filament volts, 1.4 (parallel), 2.8 (series); amperes, class Aramplifier: triode unit—plate volts, 90(110 max); grid volts, 0; amplification factor, 65; Glass octal type used as combined detector,



MEDIUM-MU TRIODE

ering the frequency range of 470 to 890 megacycles per second and employing cillator in uhf television receivers covseries-connected heater strings. Out-Miniature type used as local os-

3AF4A kelated types: 2AF4B, 6AF4A



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IWIN DIODE—HIGH-MU TRIODE

detector, amplifier, and ave tube in Miniature type used as combined television receivers employing seriesconnected heater strings. Outline 7B,

4AV6, 6AV6, 12AV6

cathode volts, 200 max. When the heater is positive with respect to the cathode, the de component of the heater-cathode voltage must not exceed 100 volts. Except for neater and heater-cathode ratings, this type is identical with miniature type 6AV6.

= Technical Data ==

TWIN DIODE

reance used as detector in television heaterstrings. Outline 7A, OUTLINES receivers employing series-connected Miniature type having high-per-SECTION. Heater volts (ac/dc), 3.15

Related types: **5AL5, 12AL5** 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6AL5. amperes,

VACUUM RECTIFIER HALF-WAVE

Duodecar type used to supply high voltage to the anode of picture tubes in television receivers. Outline 16B, OUTLINES SECTION, Tube

socket and may be mounted in any position. For high-voltage and X-ray safety considerations, refer to type 1B3-GT. Heater volts (ac/dc), 3.15; amperes, 0.22. duodecar twelve-contact requires

PULSED RECTIFIER

For operation in a 525-line, 30-frame system

MaxImum Ratings, (Design-Maximum Values):		
PEAK INVERSE PLATE VOLTAGE	30000 max	volts
Peak Plate Current	88 max	ma
AVERAGE PLATE CURRENT	1.7 max	ma
The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a	al scanning	ycle. In a

525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.



SHARP-CUTOFF PENTODE

Miniature type used as rf amplifier in television receivers employing series-connected heater strings. Out-Heater volts (ac/dc), 3.15; amperes, 7B, OUTLINES SECTION. line

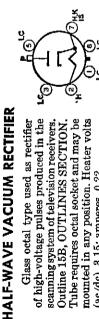
the heater is positive with respect to the cathode, the dc component of the heatercathode voltage must not exceed 100 volts. Except for heater and heater-cathode

ratings, this type is identical with miniature type 6AU6.

4AU6, 6AU6A, 12AU6 Related types:

(ac/dc), 3.15; amperes, 0.6; warm-up time (average), 11 seconds. Peak heater-OUTLINES SECTION. Heater volts

of high-voltage pulses produced in the Tube requires octal socket and may be Glass octal type used as rectifier mounted in any position. Heater volts scanning system of television receivers. Outline 15B, OUTLINES SECTION. (ac/dc), 3.15; amperes, 0.22.



PULSED RECTIFIER

For operation in a 525-line, 30-frame system Maximum Ratings, (Design-Maximum Values);

	T
ъ	:
OLTAG	:
PLATE V	URBEN
Inverse Pl	c Plate C
PEAE]	PEAK

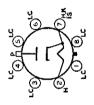
* The duration of the voltage pulse must not exceed 15 per cent of one horizontal acanning cycle. In a \$25-line, 30-frame system, 15 per cent of one horizontal acanning cycle is 10 microseconds. AVERAGE PLATE CURRENT.....

30000 max max 1.7 max 80

Ë B

HALF-WAVE VACUUM RECTIFIER

Glass octal type used as rectifier of high-voltage pulses produced in the scanning systems of television receivers. Outline 25B, OUTLINES SECTION. Tube requires octal socket and may cuits should not be connected to any of the socket terminals. Any or all of the following socketterminal connections are permissible and may be mounted in any position. Low-potential ciraid in corona reduction; socket terminals 1, 3.



and 7 may be connected together; socket terminals 2, 6, and 8 may be connected together; socket tifier in 525-line, 80-frame system: peak inverse plate voits (absolute maximum), 35000 max (de 25000 max); peak plate ma., 80 max; average plate ma., 1.1 max. For high-voltage considerations, see type 1183-GT. Type 3B2 is used principally for renewal purposes. terminal 4 may be connected to socket terminals 2 or 7, or may be used as a tie point for a heater-voltage dropping resistor. Heater volts (ac/do), 3.15; amperes, 0.22. Maximum ratings as pulsed rec-

REMOTE-CUTOFF PENTODE

Related types: **3BA6 68A6, 12BA6**

ceivers, as well as in wide-band, high-Miniature type used as rf amplifier in standard broadcast and FM refrequency applications; for use in equip-

amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this ment employing series-connected beater strings. Outline 7B, OUTLINES SECTION. Heater volts (ac/dc), 3.15; type is identical with miniature type 6BA6.

SHARP-CUTOFF PENTODE

Related types: 48C5, 6BC5

line 7B, OUTLINES SECTION. Miniature type used as rf or if amplifier in television receivers employing series-connected heater strings. Out-

6; warm-up time (average), 11 seconds. Peak heater-cathode volts, 200 max. When cathode voltage must not exceed 100 volts. Except for heater and heater-cathode the heater is positive with respect to the cathode, the dc component of the heater-Heater volts (ac/dc), 3.15; amperes, ratings, this type is identical with miniature type 6BC5.

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PENTAGRID CONVERTER

heater strings. Outline 7B, OUTLINES in superheterodyne circuits in both the standard broadcast and FM bands in equipment employing series-connected Miniature type used as converter

Related types: 3**BN**4 5BE6, 12BE6

SECTION. Heater volts (ac/dc), 3.15; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6BE6.

MEDIUM-MU TRIODE

vision tuners. The double base-pin connections for both cathode and grid reduce effective lead inductance and Miniature types used as rf amplifier in grid-drive circuits of vhf tele-

3BN4A 28N4A, 6BN4A Related types:

end resistance with consequent reduction in input conductance. In addition, the basing arrangement facilitates isolation of input and output circuits and permits Heater volts (ac/dc), 3; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, the 3BN4 and 3BN4-A are identical with miniature types 6BN4 and 6BN4-A, respectively. Type 3BN4 is a DISCONTINUED type listed short, direct connections to base-pin terminals. Outline 7B,OUTLINES SECTION. for reference only.

く対象を

BEAM TUBE



Miniature type used as combined limiter, discriminator, and af voltage amplifier in intercarrier television and FM receivers employing series-connected heater strings. Outline 7C,

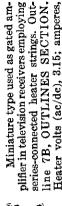
3BN6 Reialed types: 4BN6, 6BN6 OUTLINES SECTION. Heater volts (ac/dc), 3.15; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with minature type 6BN6.

SHARP-CUTOFF TWIN PENTODE

Miniature type used as combined sync separator, sync clipper, and age amplifier tube in television receivers employing series-connected heater strings. Outline 8D, OUTLINES SEC-

Retated typess 3**B**U8 **4BU8, 6BU8** TION. Heater volts (ac/dc), 3.15; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6BUS.

PENTAGRID AMPLIFIER



3BY6 Related type: 6BY6 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6BY6.

SEMIREMOTE-CUTOFF PENTODE

4BZ6, 6BZ6, 12BZ6 Related lypes:



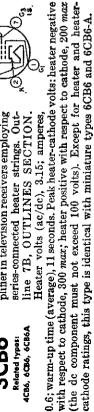


amperes, 0.6; warm-up time (average), 11 seconds. Peak heater-cathode volts when heater is negative with respect to cathode, 300 max (the dc component must not exceed 200 volts). Except for heater and heater-cathode ratings, this type is identical with miniature type 6BZ6.

SHARP-CUTOFF PENTODE

4CB6, 6CB6, 6CB6A 3CB6 Related types:

plifler in television receivers employing Miniature type used as rf or if am-

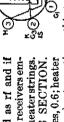


SHARP-CUTOFF PENTODE

Miniature type used as rf and if amplifier in vhf television receivers employing series-connected heater strings. Heater volts, 3.15; amperes, 0.6; heater Outline 7B, OUTLINES SECTION

telated type:

6CES



warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6CE5.

SHARP-CUTOFF PENTODE

Related type:

plifier in television receivers employing series-connected heater strings. Outline 7B, OUTLINES SECTION. Miniature type used as rf or if am-



0.6; warm-up time (average), 11 seconds. Peak heater-cathode volts: heater negative with respect to cathode, 300 max; heater positive with respect to cathode, 200 max (the dc component must not exceed 100 volts). Except for heater and heatercathode ratings, this type is identical with miniature type 6CF6. Heater volts (ac/dc), 3.15; amperes,

PENTAGRID AMPLIFIER

4CS6, 6CS6

Miniature type used as gated amplifier in television receivers employing series-connected heater strings. Out-Heater volts (ac/dc), 3.15; amperes, line 7B, OUTLINES SECTION.



0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6CS6.

106

= Technical Data =



SHARP-CUTOFF TETRODE

Miniature type used as rf amplifier in whf tuners of television receivstrings. Outline 7B, OUTLINES SECers employing series-connected heater TION. Heater volts (ac/dc), 2.9; am-

2CYS, 4CY5, 6CY5

peres, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6CY5.

FULL-WAVE VACUUM RECTIFIER

Glass octal type used as power supply in television receivers and other equipment having high de requirements. Outline 19D, OUTLINES SEC-TION. Tube requires octal socket and

may be operated in any position. It is especially important that this tube, like other power-handling tubes, be adequately ventilated. For discussion of Rating Chart, refer to INTERPRETATION OF TUBE DATA. Filament volts (ac/de), See Rating Chart See Rating Chart voire amperes amperes .050 max 1.2 max 6.5 max

AC PLATE SUPPLY VOLTAGE (Per Plate, rms).
DC OUTPUT CURRENT (Per Plate).
BULB TRANFERATURE (at hotiest point on buib surface). HOT-SWITCHING TRANSIENT PLATE CURRENT (Per Plate) PEAR PLATE CURRENT (Per Plate).

FULL-WAVE RECTIFIER

Maximum Ratings, (Design-Maximum Values):

3.3; amperes, 3.8.

Peak Inverse Plate Voltage.

200 max

RATING CHART

	-						AC PLATE SUPPLY VOLTS (RMS) PER PLATE (WITHOUT LOAD) PER PLATE (WITHOUT LOAD) PER PLATE (WITHOUT LOAD)
2.00	ER W		٥	<u>_</u>		375 G	E (WIT
AC MAXMUM OPERATING VALUES WITH	ER IT FILTER		<u>.</u>			325	SOO R PLAT
	-CHOKE-INPUT FILTER -CAPACITOR-INPUT			1			as) PEI
Jao M	PAC! TO	$\parallel \parallel$					200 .TS (R
AC AC WA XME	ĎŮ J	4		-		_	LY VOL
DG4 /OLTS		H		<u>i</u> _			SuP R Sup
TYPE 3DG4		₹_		1271		- 22	C PLAT
∄TA1	PE 250 240 —	i \$3#3		٤	JaTuo S		0

Typical Operation with Capacitor Input to Filter:

••••••••••••••••••••••••••••••••••••••		
AC Plate-to-Plate Supply Voltage (rms)	550	volts
Effective Plate-Supply Impedance per Plate. DC Output Voltage at Input to Filter (Amnox.).	95 95	μ ohm
At full-load current of 350 ma	800	volts
Characteristics		
Tube Voltage Drop for plate current of 350 ma (per plate)	25	Tolta

^c Higher values of capacitance than indicated may be used, but the effective plate-unpply impedance may have to be increased to prevent exceeding the maximum rating for peak plate current, 107

Related types: 6DK6, 12DK6

Miniature types used as intermediate-frequency amplifier in television receivers. Outline 7B, OUTLINES SECTION. Heater volts (ac/dc), 3.15, amperes. 0.6; warm-up time (average),

11 seconds, Peak heater-cathode volts: heater negative with respect to cathode, $300 \ max$; heater positive with respect to cathode, $200 \ max$ (the de component must not exceed 100 volts). Except for heater and heater-cathode ratings, this type is identical with miniature type 6DK6.

3DT6

3DT6A

4DT6A, 6DT6A

SHARP-CUTOFF PENTODE

Miniature types used as FM detector in television receivers employing series-connected heater strings. Outline 7B, OUTLINES SECTION. Heater volts (ac/dc), 3.15; amperes, 0.6;

warm-up time (average), 11 seconds. Except for heater ratings, these types are identical with miniature types 6DT6 and 6DT6-A, respectively. Type 3DT6 is a DISCONTINUED type listed for reference only.

MEDIUM-MU TRIODE

3DZ4 Related types: 20Z4, 60Z4

Miniature type used as a localoscillator tube in uhf television receivers covering the frequency range from 470 to 890 megacycles and employing series-connected heater strings.

Outline 7A, OUTLINES SECTION. Heater volts (ac/dc), 3.2; amperes, 0.45; warm-up time (average), 11 seconds. Peak heater-cathode volts, 180 max (the dc component must not exceed 100 volts when heater is positive with respect to cathode). Except for heater and heater-cathode ratings, this type is identical with miniature type 6DZ4.

Miniature type used as rf amplifier in whf tuners of television receivers having series-connected heater strings.

3EA5

Related lype:

6EA5

Heater volts (ac/dc) 2.9; ampered, 6.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6EA5.

SEMIREMOTE-CUTOFF PENTODE

Miniature type used as if-amplifier tube in television receivers. Outline SC, OUTLINESSECTION. Heater volts (ac/dc), 3.4; amperes, 0.6; Except for heater ratings, this type is identical with miniature type 6EH7.

Related types

4EH7, 4EH7

3EH7

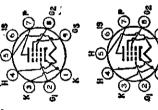
SHARP-CUTOFF PENTODE

Miniature type used as if-amplifier tube in television receivers. Outline SC, OUTLINES SECTION. Heater volts (ac/dc), 3.4; amperes, 0.6. Except for heater ratings, this type is identical with miniature type 6EJ7.

Related types: 4EJ7, 6EJ7

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3EJ7



= Technical Data ==

HIGH-MU TRIODE

Miniature type with frame grid used in vhf tuners of television receivers. Outline 7B, OUTLINES SECTION. Heater volts (ac/dc), 2.8; amperes, 0.45. Except for heater ratings, this type is identical with miniature type 6ER5.

Related lypes: 2ER5, GER5

3ER5

3FH5 Reloted types: 2FHS, OFHS

HIGH-MU TRIODE

Miniature type used as rf-amplifer tube in vhf tuners of television receivers employing series-connected heaterstrings, Outline 7B, OUTLINES SECTION. Heater volts (ac/dc), 3;

amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6FH5.

HIGH-MU TRIODE

Miniature type with frame grid used as grounded-cathode rf-amplifier tube in vhf tuners of television receivers employing series-connected heaterstrings. Outline 7B, OUTLINES

Selated lype:

2GK5, 6GK5

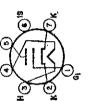
SECTION. Heater volts (ac/dc), 2.8; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6GK5.

SHARP-CUTOFF TWIN PENTODE

Miniature type used as combined sync separator, sync clipper, and age amplifier tube in television receivers employing series-connected heater strings. Outline 8D, OUTLINES SEC-

TODE 3GS8/ ined 3BU8 age 3BU8 vers related types ter 4658/4805 TION. Heater volts (ac/dc), 3.15; amperes, 0.6. Except for heater ratings, this type is identical with miniature type 4GS8/4BU8.

HIGH-MU TRIODE



Miniature type used as rf-amplifer tube in vhf television tuners. Outline 74, OUTLINES SECTION. Heater volts (ac/de), 2.7; amperes, 0.45. Except for heater ratings, this type is identical with miniature type 6HA5.

SHA5

SHARP-CUTOFF TWIN PENTODE

Miniature type used in age amplifier, sync, and noise-limiting circuits of television receivers employing series-connected heater strings. One

SHSS OHSS.

K G3PI pentode unit is used as a combined sync separator and sync clipper; the other pentode unit is used as the age amplifier.

SHARP-CUTOFF PENTODE

Related types: 4JC6, 6JC6

Miniature type with frame grid used in if-amplifier stages of television receivers utilizing intermediate frequencies in the order of 40 megacycles and employing series-connected heater

0.6; heater warm-up time (average), 11 seconds. Except for heater ratings, this strings. Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), 3.5; amperes, type is identical with miniature type 6JC6.

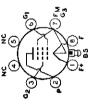
SHARP-CUTOFF PENTODE

Related types: **3JD6** 4JD6, 6JD6

der of 40 megacycles and employing Miniature type used as if-amplifier tube in television receivers utilizseries-connected heater strings. Outing intermediate frequencies in the or-

miniature type 6JD6.

ac/dc/battery portable receivers. Outline 13A, OUTLINES SECTION. Tube requires lock-in socket. Filament volts (dc), 1.4 (parallel), 2.8 For electrical characteristics, refer to glass-octal type 3Q5-GT. Type 3LF4 is used principally (series); amperes, '.1 (parallel), for renewal purposes.



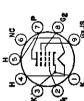
POWER PENTODE

equipment. Outline 7B, OUTLINES SECTION. Except for terminal connections, types 3Q4 and Miniature type used in output stage of ightweight, compact, portable battery-operated 3V4 are identical. Refer to type 3V4 for ratings and typical operation. Type 3Q4 is used principally for renewal purposes.

BEAM POWER TUBE

Glass octal type used in output stage of ac/de battery portable receivers. Outline 14C, OUTLINES SECTION. This type may be supplied with p.n 1 omitted. Filament volts (dc), 2.8 in serier filament arrangement and 1.4 in 0.1 (parallel). Typical operation as Class A. amplifier: plate and grid-No.2 volts, $110 \ max$; parallel arrangement; amperes 0.05 (series) volts, -6.6; peak af grid-No.1 volts, grid-No.1

total cathode ma., 6 moz for each 1.4-volt filament section; plate resistance (approx.), 0.11 megohm (series), 0.1 megohm (paralle!); transconductance, 2000 µmhos (series), 2200 µmhos (parallel); load resistance, 8000 ohms; total harmonic distortion, 8.5 per cent (series), 6 per cent (parallel); max.-signal powor output, 830 mw (series), 400 mw (parallel). This type is used principally for renewal purposes. 5.1 (series), 5.4 (parallel); plate ma., 8.5 (series), 10 (parallel); grid-No.2 ma., 1.1 (series), 1.4 (parallel);



line 8B, OUTLINES SECTION. Heater volts (ac/dc), 3.5; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with

BEAM POWER TUBE

Glass lock-in type used in output stage of 0.05 (series).



per second. Outline 7B, OUTLINES SECTION. Heater volts (ac/dc), 4.2;

POWER PENTODE

- Technical Data

Miniature type used in output stage of lightweight, compact, portable, battery-operated equipment, Outline 7B, OUTLINES SEC-PION. Tube requires miniature seven-contact socket. Filament volts (dc), 2.8 (series), 1.4 (parallel); amperes, 0.05 (scries); 0.1 (parallel). Pypical operation as class A₁ amplifier: plate and grid-No.2 volts, 67.5 (90 max); grid-No.1

volts, -7; peak af grid-No.1 volts, 7; zero-signal

plate ma., 6 (series) 7.2 (parallel); zero-signal grid-No.2 ma., I.2 (series), 1.5 (parallel); plate resistance (approx.); 0.1 megohm; transconductance, 1400 μmhos (series), 1550 μmhos (parallel); load resistance, 5000 obns; maximum-signal power output, 160 milliwatts (series), 180 milliwatts (parallel). This type is used principally for renewal purposes,

POWER PENTODE

Typical operation as class A₁ amplifier; plate and grid-No.2 volts, 90 (100 max); grid-No.1 volts, -4.5; peak af grid-No.1 volts, 4.5; zero-Miniature type used in output stage of lightweight, compact, portable, battery-operated equipment. Outline 7B, OUTLINES SEC-TION. Tube requires miniature seven-contact socket. Filament volts (dc), 2.8 (series), 1.4 (parallei); amperes, 0.05 (series), 0.1 (parallel).

signal plate ma., 7.7 (series), 9.5 (parallel); grid-No.2 ma., zero-signal, 1.7 (series), 2.1 (parallel); plate resistance (approx.), 0.12 megohm (series), .1 megohm (parallel); transconductance, 2000 umhos (series), 2150 µmhos (parallel); load resistance, 10000 ohms; maximum-signal power output, 240 milliwatts (series), 270 milliwatts (parallel). This type is used principally for renewal purposes.

SHARP-CUTOFF PENTODE

series-connected heater strings. Outline Miniature type used as rf amplifier in television receivers employing 7B, OUTLINES SECTION. Heater volts (ac/dc), 4.2; amperes, 0.45;

3AU6, 6AU6A, 12AU6 Related hypes:

warm-up time (average), 11 seconds. Peak heater-cathode volts: heater negative with respect to cathode, 200 max; heater positive with respect to cathode, 200 max (the de component must not exceed 100 volts). Except for heater and heater-cathode ratings, this type is identical with miniature type 6AU6.

TWIN DIODE—HIGH-MU TRIODE

SECTION. Heater volts (ac/dc), 4.2; amperes, 0.45; warm-up time (average), 11 detector, amplifier, and ave tube in Miniature type used as combined ceivers employing series-connected automobile and ac-operated radio reheater strings. Outline 7B, OUTLINES

3AV6, 6AV6, 12AV6 Related types:

seconds. Except for heater ratings, this type is identical with miniature type 6AV6. **4BC5** at frequencies up to 400 megacycles Miniature type used in compact radio equipment as an rf or if amplifier SHARP-CUTOFF PENTODE

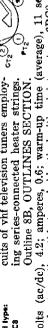
Related types: 3BC5, 6BC5]]]

amperes, 0.45; warm-up time (average), 11 seconds. Peak heater-cathode volts: heater negative with respect to cathode, 200 max; heater positive with respect to cathode, 200 max (the dc component must not exceed 100 volts). Except for heater and heater-cathode ratings, this type is identical with miniature type 6BC5.

MEDIUM-MU TWIN TRIODE

Related type:

Miniature type used in directcoupled cathode-drive rf amplifier circuits of whf television tuners employing series-connected heater strings.



Heater volts (ac/dc), 4.2; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater rating, this type is identical with miniature type 6BC8.

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

4BL8 Related type:

Except for heater ratings, this type is Miniature type used in frequencychanger service in television receivers. Outline 8B, OUTLINES SECTION, Heater volts (ac/dc), 4.6; amperes, 0.6 identical with miniature type 6BL8.

BEAM TUBE

4BN6 Related lypes: 3BN6, 6BN6

Miniature type used as combined age amplifier in intercarrier television connected heater strings. Outline 7C, limiter, discriminator, and audio-voltand FM receivers employing series-

OUTLINES SECTION. Heater volts (ac/dc), 4.2; amperes, 0.45; warm-up time (average), 11 seconds. Peak heater-cathode volts, 200 max. When the heater is positive with respect to the cathode, the dc component of the heater-cathode voltage must not exceed 100 volts. Except for heater and heater-cathode ratings, this type is identical with miniature type 6BN6.

MEDIUM-MU TWIN TRIODE

4BQ7A Related types:

58Q7A, 68Q7A

Miniature type used in directing series-connected heater strings. coupled cathode-drive rf amplifier circuits of whf television tuners employ-Outline 8B, OUTLINES SECTION

Heater volts (ac/dc), 4.2; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6BQ7-A.

MEDIUM-MU TWIN TRIODE

5519

Miniature type used in directcoupled cathode-drive rf amplifier circuits of whf television tuners employing series-connected heater strings. Outline 8B, OUTLINES SECTION.

Heater volts (sc/dc), 4.5; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6BSS.

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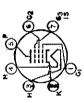
SHARP-CUTOFF TWIN PENTODE

= Technical Data

amplifier tube in television receivers sync separator, sync clipper, and age strings, Outline 8D, OUTLINES SEC-Miniature type used as combined employing series-connected heater

Related types: 35U8, 65U8 **4BU8**

TION. Heater volts (ac/dc), 4.2; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6BU8.



SEMIREMOTE-CUTOFF PENTODE

(ac/dc), 4.2; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater LINES SEČTION. Heater volts ratings, this type is identical with miniature type 6BZ6.

heater strings. Outline 7B, OUT-

ceivers

trolled video if stages of television reemploying series-connected

Miniature type used in gain-con-

3BZ6, 6BZ6, 12BZ6

Related lypes:

4BZ6

MEDIUM-MU TWIN TRIODE

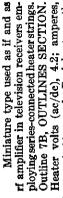
Miniature type used in directcoupled cathode-drive rf amplifier circuits of whf television tuners employing series-connected heater strings. Outline 8B, OUTLINES SECTION.

4BZ7 Related type

6BZ7

Heater volts (ac/dc), 4.2 amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6BZ7.





3CB6, 6CB6, 6CB6A **4CB6** Related types:

tive with respect to cathode, 300 max (the dc component must not exceed 200 volts); heater positive with respect to cathode, $200 \ max$ (the dc component must not exceed 100 volts). Except for heater and heater-cathode ratings, this type is 0.45; warm-up time (average), 11 seconds. Peak heater-cathode volts: heater negaidentical with miniature types 6CB6 and 6CB6-A.

PENTAGRID AMPLIFIER

Outline 7B, OUTLINES SECTION. amplifier in television receivers, In such service, it may be used as a com-Miniature type used as a gated bined sync separator and sync clipper.

Related types: 3CS6, 6CS6 Heater volts (ac/dc), 4.2; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6CS6.

SHARP-CUTOFF TETRODE

Miniature type used as rf amplifier in vhf tuners of television receivers employing series-connected heater

4CY5

peres, 0.3; warm-up time (average), 11 seconds. Except for heater ratings, this type 2CY5, 3CY5, 6CY5 Related types: strings. Outline 7B, OUTLINES SEC-TION. Heater volts (ac/dc), 4.5; amis identical with miniature type 6CY5.

SHARP-CUTOFF PENTODE

quency in the order of 40 megacycles Miniature type used in the gaincontrolled picture if stages of television receivers utilizing an intermediate freper second. Also used as an rf amplifier

4DE6

Related 1ype:

in vhf television tuners. Outline 7B, OUTLINES SECTION. Heater volts (ac/dc), 4.2; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this tube is identical with miniature type 6DE6.

SHARP-CUTOFF PENTODE

4DT6

Miniature types used as FM de-4.2; amperes, 0.45;

4DT6A 3DT6A, 6DT6A Related types: series-connected heater strings. Outline tector in television receivers employing 7B, OUTLINES SECTION. Heater volts (ac/de),

warm-up time (average), 11 seconds. Except for heater ratings, these types are identical with miniature types 6DT6 and 6DT6-A, respectively. Type 4DT6 is a DISCONTINUED type listed for reference only.



SEMI REMOTE-CUTOFF PENTODE

line 8C, OUTLINES SECTION. Heatfier tube in television receivers. Out-Except for heater ratings, this type is Miniature type used as if-amplier volts (ac/dc), 4.4; amperes, 0.45 identical with miniature type 6EH7.

Related types: 3EH7, 6EH7

4EH7

SHARP-CUTOFF PENTODE

Miniature type used as if-amplifler tube in television receivers. Outline volts (ac/dc), 4.4; amperes, 0.45. Except for heater ratings, this type is 8C, OUTLINES SECTION. Heater identical with miniature type 6EJ7.

Related types: 3EJ7, 6EJ7

4EJ7

VARIABLE-MU TWIN TRIODE

cuits of television receivers employing Miniature type used in directcoupled cathode-drive rf amplifier cirseries-connected heater strings. Outline 8B, OUTLINES SECTION

GT2

Related type:

Heater volts (ac/dc), 4; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6ES\$.



SHARP-CUTOFF PENTODE

mediate frequency in the order of 40 Miniature type used in the gaincontrolled picture-if stages of vhf television receivers operating at an intermegacycles per second. Outline 7B,

OUTLINES SECTION. Heater volts (ac/dc), 4.2; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6EW6.

= Technical Data =

SHARP-CUTOFF TWIN PENTODE

Miniature type used as combined sync separator, sync clipper, and age amplifier tube in television receivers employing series-connected heater strings. Outline 8D, OUTLINES SEC-

Related type 3GS8/3BU8

4BU8

TION. Tube requires miniature nine-contact socket and may be mounted in any position.

volts ampere seconds	adaga	
4.2 0.45 11	2 6 3.8 6.015 max	
Heater Voltage (ac/dc). Heater Current. Heater Warm-Up Time (A verage).	DIRECT INTERLECTRODE CRACUTANCES: Grid No.3 to All Other Electrodes: Grid No.3 to All Other Electrodes: Grid No.1 to All Other Electrodes: Plate to All Other Electrodes (Each Unit). Plate to All Other Electrodes (Each Unit).	

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Maximum Values):		
PLATE VOLTAGE (Each Unit)	£00 max	volte
Grid-No.3 (suppressor-grid) Voltage (Each Unit):	04	1
Peak positive value	201111111111111111111111111111111111111	VOILS
DC negative value	arout no-	AOITS
DC positive value	e max	volts
GRID-NO.2 (SCREEN-GRID) VOLTAGE	150 max	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE, Negative bias value	-50 max	voits
CATEODE CURRENT,	12 max	ma
GRID-No.2 Input	0.75 max	Watt
PLATE DISSIPATION (Each Unit)	1.1 max	watts
PEAK HEATER-CATHODE VOLTAGE:	000	:
Heater negative with respect to cathode	200 max	voits
Heater positive with respect to cathode	200 002	VOILE

Plate Current. Grid-No.3 Voltage (Approx.) for plate current of 100 μ a Grid-No.1 Voltage (Approx.) for plate current of 100 μ a Maximum Circuit Values	
---	--

volta volta

E

1015-01 1015-01

Grid-No.1 Transconductance.....

megohm

0.5 max 0.5 max

Grid-No.3-Circuit Resistance (Each Unit)..... Grid-No.1-Circuit Resistance. The de component must not exceed 100 volts.

*Adjusted to give a de grid-No.1 current of 100 microamperer. • With plate and grid No.3 of the other unit connected to ground.



4EW6 Related types:

SEW6, 6EW6

POWER PENTODE

Miniature type used in audio output stages of radio and television reheater strings. Outline 7B, OUTLINES ceivers employing series-connected

seven-contact socket and may be mounted in any position. Heater volts (ac/dc), 4; SECTION. Tube requires miniature amperes, 0.6; warm-up time (average), 11 seconds.

115

Maximum Ratings, (Design-Maximum Values):

CONTINUE CON		
PLATE VOLTAGE.	300 max	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE.	300 max	volts
GRID-NO.1 (CONTROL-CRID) VOLTAGE, Positive-bias value	0 max	volts
AVERAGE CATHODE CURRENT	30 max	ma
PLATE DISSIPATION	4.8 max	watts
GRID-No.2 Input.	1.1 max	watts
Peak Heater-Cathode Voltage:		,
Heater negative with respect to eathode	200 max	Volte
Heater positive with respect to cathode	200 -max	volts
BULE TEMPERATURE (At hottest point)	200 max	ပ္
Typical Operations		
	250	volts
	250	volts
Cartoda Biss Resistor 270	270	ohms
	63	volts
	16	103
Maximum-Signal Plate Current.	16	E CL
	2.1	E CLI
	,¢	e cu
Plate Resistance (Approx.)	0.15	megopu
	8400	godina
I nad Resistance	15000	ohms
Total Harmonic Distortion	10	per cent
Maximum-Signal Power Output, 1.8	1.1	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:

For fixed-bias operation.

For eathode-bias operation.

*The de component must not exceed 165 voits.

megohm текорт

0.5 max 1 max

SHARP-CUTOFF PENTODE

Miniature type with frame grid vision receivers employing series-connected heaterstrings. Outline 8B, OUT-LINES SECTION. Tube requires minused in the if-amplifier stages of tele-

lature nine-contact socket and may be mounted in any position. Heater volts (ae/dc), 4.2; amperes, 0.45; warm-up time (average), 11 seconds.

CLASS AL AMPLIFIER

volts

Maximum Ratings, (Design-Maximum Values).	PLATE VOLTAGE,
Maximum R	PLATE VOLT

volts	200 max	Heater negative with respect to cathode
4014	2000 mm	PEAK HEATER-CATHODE VOLTAGE:
page 10	See curve page 10	For grid-No.2 voltages between 125 and 150 volts
7.0	0.0 max	For grid-No.2 voltages up to 125 volts
1		GRID-No.2 INPUT:
	27.0 mag	PLATE DISSIPATION
1	20 114(4)2	CATHODE CURRENT
SIICA	-Dr. max	GRID-No.1 (CONTROL-GRID) VOLTAGE, Negative-bias value
visikų Palen	See curve page 10	GRID-No.2 Voltage
VOIUS	Zon max	GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE
2 1	TOWN DET	PLATE VOLTAGE,
400	0	MAXIMONI REINES, (Congression of the maximon of the congression of the

Ie at soc v ot mego	Þ
125 ted to cathod 125 56 0.156 15000	32,9
Characteristics: 125 vor Characteristics: 125 vor Grid No.3 (Suppressor Grid). Connected to cathode at soc Grid No.3 (Suppressor Grid). Voltage. Voltage. Cathode Bias Resistor. Connected to cathode at soc Cathode Bias Resistor. Connected to cathode at soc Discontinuous Cathode Disconti	Plate Current. Grid-No.2 Current. Grid-No.1 Voltage (Approx.) for transconductance of 100 mmhos

= Technical Data =

Maximum Circuit Values

0.25 max 1 max Grid-No.1-Circuit Resistance: For fixed-bias operation. For cathode-bias operation. The de component must not exceed 160 volts.

megohm megohm

P2()

SHARP-CUTOFF TWIN PENTODE

plifier, sync, and noise-limiting circuits connected heater strings. One pentode Miniature type used in age amof television receivers employing seriesunit is used as a combined sync sepa-

Related lypes: 3HS8, 6HS8

rator and sync clipper; the other pentode unit is used as the agc amplifier. Outline 8D, OUTLINES SECTION. Heater volts (ac/dc), 4.2; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6HS8. ම_{ුදු} :



SEMIREMOTE-CUTOFF PENTODE

used in the if-amplifier stages of tele-Miniature type with frame grid vision receivers employing series-connected heater strings. Outline 8B, OUT-

K St. I.INESSECTION Tuberequiresminiature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 4.2; amperes, 0.45; warm-up time (average), 11 seconds.

CLASS As AMPLIFIER

Maximum Ratings, (Design-Maximum Values):

250 max volts 250 max volts See curve page 70 -50 max volts 25 max volts	2.5 max watts 0.6 max watt	See curve page 70	200 max volus
PLATE VOLTAGE (GRID-NO.2 (SORBENGER)) SUPPLY VOLTAGE (GRID-NO.2 VOLTAGE) GRID-NO.1 (CONTROL-GRID) VOLTAGE, NEGRITVE-bias value.	OATHOUS DESIDATION GRID-NO.2 INPUT: For orid-No.2 voltages up to 125 volts	For grid-No.2 voltages between 125 and 250 volta.	Heater negative with respect to canode

	ì	1	
Plate Supply Voltage. Plate Suppressor Grid).	ed to extboo	Polts e at socket	
Grid-No.2 Supply Voltage.	125	Volta	
Resistor	0.143	megopus	
rigos pesistados (Apploa).	14000	soum	
Plate Clirrent	-	#UI	
Grid-No.2 Current.	4 19 7	Tolta	
Maximum Circuit Values			
-tvo.z-creur restatance. For fixed-bias operation	0.25 ma 1 ma	0.25 max megohm 1 max megohm	

FThe de component must not exceed 100 volts.

SHARP-CUTOFF PENTODE Miniature type with frame grid used in if-amplifier stages of television receivers utilizing intermediate frequencies in the order of 40 megacycles

cket

olts

rolts hms ohm ohm ma ma ma

Related types: 3JC6, 6JC6

strings. Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), 4.5; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is and employing series-connected heater identical with miniature type 6JC6.

117

SHARP-CUTOFF PENTODE

Retarted 1ypes: 3JD6, 6JD6

Miniature type used as if-amplifier tube in television receivers utilizing intermediate frequencies in the order of 40 megacycles and employing series-connected heater strings. Out-



time (average), 11 seconds. Except for heater ratings, this type is identical with line 8B, OUTLINES SECTION. Heater volts (ac/dc), 4.5; amperes, 0.45; warm-up miniature type 6JD6.

DIODE—SHARP-CUTOFF PENTODE

Related type: 6AM8A

Miniature type used in diversified applications in television receivers employing series-connected heater strings. The pentode unit is used as an amplifier and the high-perveance diode as a

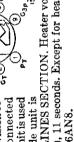


4.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, detector or de restorer. Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), this type is identical with miniature type 6AM8-A.

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-

5AN8 Retated type: 6AN8A

Miniature type used in a wide as an amplifier and the triode unit is variety of applications in television receivers employing series-connected heater strings. The pentode unit is used



used in oscillator or sync circuits. Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6AN8.

BEAM POWER TUBE

5AQ5 Related types:

5AQ5A, 12AQ5

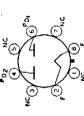
Miniature type used as audio amplifier in television receivers employing series-connected heater strings. Outline 7C, OUTLINES SECTION.

warm-up time (average), 11 seconds. Except for heater ratings, this type is Heater volts (ac/dc), 4.7; amperes, 0.6;

identical with miniature type 6AQ5-A.

FULL-WAVE VACUUM RECTIFIER

Glass octal types used in power supply of television receivers having high de requirements. Type 5AS4-A, Type 5AS4 maximum dimensions: Outline 19C, OUTLINES SECTION



beres, 3.0. For maximum ratings, typical operation, and curves, refer to type pins 1 and 4 are in vertical plane. It is especially important that these tubes, like other power-handling tubes, be adequately ventilated. Heater volts (ac), 5.0; amover-all length, 5-1/8 inches; seated height, 4-9/16 inches; diameter, 2-1/16 inches. Type 5AS4-A may be supplied with pins 3, 5, and 7 omitted. Tubes require octal socket. Vertical mounting is preferred, but horizontal mounting is permissible if 5U4-GB. Type 5AS4 is a DISCONTINUED type listed for reference only.

DIODE-SHARP-CUTOFF PENTODE

= Technical Data =

fier and the high-perveance diode as a Miniature type used in diversified applications in television receivers employing series-connected heater strings. The pentode unit is used as an ampli-

Related type: 6A58 detector or de restorer. Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6AS8.

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

Miniature type used as combined oscillator and mixer tube in television receivers employing series-connected heater strings, Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), 4.7.

Refuted type:

amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6AT8-A.

FULL-WAVE VACUUM RECTIFIER

Glass octal type used as power supply in television receivers and other equipment having high de requirelength, 4-3/4 inches; seated height, ments. Maximum dimensions: over-all

4-3/16 inches; diameter, 1-11/16 inches. Tube requires octal socket and must be used in vertical position; horizontal operation is permissible only if pins 2 and 4 are in vertical plane. It is especially important that this tube, like other powerhandling tubes, be adequately ventilated. Filament volts (ac/dc), 5; amperes, 3.75. For discussion of Rating Chart, refer to INTERPRETATION OF TUBE DATA.

FULL-WAVE RECTIFIER

Maximum Ratings, (Design-Center Values):

Peak Inverbe Plats Voltage..... PEAK PLATE CURRENT (Per Plate)

(Per Plate), maximum duration 0.2 second..... AC PLATE SUPPLY VOLTAGE (Per Plate, rms)

See Rating Chart See Rating Chart amberes 5.25 max

1400 max 1075 max

DC OUTFUT CURRENT (Per Plate).....

RATING CHART

AC PLATE SUPPLY VOLTS (RMS) PER PLATE (WITHOUGH LOAD) MAXIMUM OPERATING VALUES WITH CHOKE—INPUT FILTER 5AU4 VOLTS AC 8 250 MEN CONTRUCT MILLIAMPERES PER

Choke volta 1000 ut	50 volta
Typical Operation: Capacitar Filter Input 600 800 AC Plate-to-Plate Supply Voltage (fms) 600 800 Filter-Input Capacitor 40 40 Filter-Input Capacitor 80 60 Filter-Input Capacitor 80 60 Filter-Input Caloke. 60 60 DC Output Current. 80 326 DC Output Current. 80 326 DC Output Voltage at Input to Filter (Approx.) 276 836	Characteristics, Instantaneous Value: Tube Voltage Drop for plate current of 850 ma (per plate)

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

heater strings. Outline 8B, OUTLINES . SECTION. Tube requires miniature nine-contact socket and may be Miniature type used in a wide variety of applications in television receivers employing series-connected mounted in any position.



wolts ampers seconds	ቘቘቘ	2 2222
6.0 11	1.5 2 0.84	0.04 max 7 3 0.005 0.006
Heater Voltage (ac/do) Heater Current Time (Aperage) Firecter Warm-Ut Time (Aperage) Firecter Vaterelectrode Capacitanobs:	Triode Unit: Grid to Plate Grid to Cathode and Heater Plate to Cathode and Heater	Pentode Unit: Grid No.1 to Plate Grid No.1 to Plate Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield. Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield. Plate to Cathode, Heater, Grid No.2, Grid No.1 to Triode Grid to Pentode Plate Pentode Grid No.1 to Triode Plate Pentode Grid No.1 to Triode Plate

Pentode Unit	300 max volts	800 max volts	ve Da	0 max volts	2 mag watts	0,5 max watt	See curve page 70	200 max wolts	200°max volts	0 volts			emdo o	- opma		4	-8 volts	£ ma	8 Ins	0.25 max megobus 1.0 max megobus	ace for both units
nit Pento	300		å			0.5	å			200	160	•	180	·	800000	6200	1	9.0	63		nit resistar
Trinds Unit	300 max	1	1	0 max	2.6 max	•	•	200 max	200° max	006	1	۴	•	19	67 50	8300	-19	13	1	0.5 max 1.0 max	l-No.1-circ
CLASS As AMPLITIES	Maximum Ratings, (Design-Center Vatues):	PLATE VOLTAGE	GRID NO.2 SUPPLY VOLTAGE	GRID -No. 2 (SCREEN-GRID) VOLIAGE	GRID-NO.1 (CONTROL-LAID) YOUACS, LOSSES PRATICALLY, TOTALLY, LOSSES PRATICALLY, LOSSES PR	Gaip-No.2 Input:	For grid-No.2 voltages up to Lev vorts For grid-No.2 voltages between 150 and 300 volts	PRAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cachotte Heater positive with respect to cathode	Characteristics	Plate Supply Voltage	Grid-No.2 Supply Voltage	Grid-No.1 Voltage	Cathode-Bias Resistor	Amplification Factor	Plate Resistance (Approx.)	Transconductance	Grid-No.1 Voltage (Approx.) for place current of re-	Plate Current	Grid-No.2 Current Grid-No.1-Circuit Besistance:* For fared-bias operation For cathode-bias operation	 The dc component must not exceed 100 volts. If either unit is operating at maximum rated conditions, grid-No.1-circuit resistance for both units should not exceed the stated values.

= Technical Data

FULL-WAVE VACUUM RECTIFIER

plies of radio and television receivers mumdimensions:over-all length, 5-3/16having high de requirements. Maxi-Glass octal type used in power sup-

inches; seated length, 4-5/8 inches;

position. It is especially important that this tube, like other power-handling tubes, be adequately ventilated. Filament volts (ac/dc), 5; amperes, 3.7. For discussion of diameter, 1-9/16 inches. Tube requires octal socket and may be operated in any Rating Chart, refer to INTERPRETATION OF TUBE DATA.

FULL-WAVE RECTIFIER

Maximum Ratings, (Design-Center Values): PEAK INVERSE PLATE VOLTAGE	:	1550 max	volts
Peak Flats Current [Fer Flate]. Hot-Switching Transient Plats Current	:		A water ammeries
(Fer Fixe) maximum duration of a second. AC Plate Supply Voltage (Per Plate, rms)		See Rati	See Rating Chart
Typical Operation:	:		
Filter Input Cap	Capacitor	Choke	
AC Plate-to-Plate Supply Voltage (rms)9	900	1100	volts
	20	ı	Jr/
	153	t ;	en io
	1	10	henries
	250	250	ma
	422	440	volts
Characteristics, Instantaneous Yalve:			
Tube Voltage Drop for plate current of 250 ma (per plate)	:	20	volta

	S WITH:	<u>e</u>					O 100 200 300, 400 500 600 700 AC PLATE SUPPLY VOLTS (RMS) PER PLATE (WITHOUT LOAD)
	ING VALUES WITH:	ÜT FILTE	Ĭ	Ź	3	540	500 31 PLATE
	PERATINI	100 m	F 7			440	A00 (RMS) PE
	MAXIBUM O				+		300 WOLTS
TYPE SAW4	WA			-	1		SUPPLY
TYPE 5		3	3	8	3	9	Ac PLATE

FULL-WAVE VACUUM RECTIFIER

Lock-in type used in power supply of radio equipment having moderned of requirements. Outline 18B, OUTLINES SECTION. Tube requires lock-in socket, Filament volts. (ac.), 5.0; amperes, 2.0. Maximum ratings as full-wave rectifier: peak inverse plate volts, 1400 max; peak plate ma. (per plate), 375 max; de output ma., 125 max. This type is used principally for renewal purposes.

Cheke 1000 Capaciter 700 4 E0 AC Plate-to-Plate Supply Voltage (rms)
Filter-input Capacitor
Filter-input Capacitor
Filter-input Capacitor
Filter-input Coloke

Filler Input

Typical Operations

obnas henries 121 FULL-WAVE RECTIFIER

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5 max amperes See Rating Chart See Rating Chart

AC PLATE-SUPPLY VOLTAGE (Per Plate, rms)...... DC Ourput Current (Per Plate).....

Hor-Switching Transient Plate Current (Per Plate)",

PEAK PLATE CURRENT (Per Plate). PEAK INVERSE PLATE VOLTAGE...

Maximum Ratings, (Design-Maximum Values):

втреге

1 max1700 max

8; A 8; A 810A

520

volts volts

1 1 88

1 09

390 1 188

300 ma..... 275 ma..... 162 ma..... 150 ma..... 137.5 ma..... 81 ma.

At load current of:

Total Effective Plate-Supply Impedance per Plate.... DC Output Voltage at Input to Filter (Approx.): AC Plate-to-Plate Supply Voltage (rms).....

Filter-Input Capacitor

Typical Operation with Capacitor Input to Fifters

volta

h ando

2 4 5

volts benries

2 2 2

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AC Plate-to-Plate Supply Voltage (rms).....

Typical Operation with Choke Input to Filter.

volts volts volta

455

volta

1 5

355

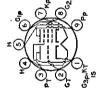
348 ma.....

Filler Input	Capacitor	Choke	
DC Output Current	125	125	ma
DC Output Voltage at Input to Filter (Approx.):			
At half-load current (62.5 ma.)	392.5	405	volts
At full-load current (125 ma.)	340	385	volts
Voltage Regulation (Approx.):			
Half-load to full-load current	52.5	53	volts

 ϕ When a filter-input capacitor larger than 40 μ , is used, it may be necessary to use more plate-supply impedance than the value shown in order to limit the peak plate current to the rated value.

MEDIUM-MU TRIODE—

Miniature type used as combined receivers employing series-connected heater strings. Outline 8B, OUTLINES SECTION. Tube requires miniature whf oscillator and mixer in television SHARP-CUTOFF PENTODE



nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 seconds.

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SS A ₁
ASS A1
CLASS A1
CLASS A1

לבאסס או אשו רוו זבע			
•	Trieds	Pentode	
Maximum Ratings, (Design-Center $Values$):	Unit	Unit	
рт. в тв Vol. така	300 max	300 max	volts
Gerb No.2 (SCREEN-GRID) SUPPLY VOLTAGE	1	300 max	volts
GRID-No.2 VOLTAGE	•	See curve page 70	page 70
GRID-No.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	0 max	0 max	volta
PLATE DISSIPATION	2.5 max	2 max	watts
Grid No.2 Input:			:
For grid-No.2 voltages up to 150 volts	,	U.b max	Watt
For grid-No.2 voltages between 150 and 300 volts	,	See curve page 70	bage 70
PEAK HEATER-CATHODE VOLTAGE:	200 200	200 200	volta
Heater negative with respect to cathode	200 max	200 max	volts
Characteristics.			
Plate Surply Voltage	200	200	volts
Crid-No 2 Supply Voltage	1	150	volts
Crid Voltage	φ	,	volta
Carbode Bion Remistor	ı	180	ohma
Amplification Factor	19	1	
Plate Resistance (Approx.)	6750	800000	ohme
Transconding and	8300	6200	oquan
Plate Current	13	9.6	m
Grid-No.2 Current	ı	8.3	ma
Grid-No.1 Voltage (Approx.) for plate current of 10 µa	-19	87	volta
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance":	n i	30.0	and other
For fixed-bias operation	1.0 mga	20m 07'0	перопп
For eathode-bias operation	TO WELL	TO MAKE	mekonn
The de component must not exceed 100 voits.	Mo 1-aironit	Passistumos for h	oth mit-

FULL-WAVE VACUUM RECTIFIER

* If either unit is operated at maximum rated conditions, grid-No.1-circuit resistance for both units should not exceed the stated values.

Novar type used in power supplies Tube requires novar nine-contact of radio equipment and television receivers having high de requirements. Outline 17B, OUTLINES SECTION.

position if pins 2 and 7 are in vertical plane. It is especially important that this tube, like other power-handling tubes, be adequately ventilated. Filament volts socket. Vertical operation is preferred, but tube may be operated in horizontal ୍ଦ୍ର (ac), 5; amperes, 3.

Such circuits limit the hor-switching current to a value no higher than that of the peak plate current. When capacitor-input circuits are used, a maximum peak current value per plate of 5 amperes during the initial cycles of the hor-switching transient should not be exceeded. ■ Higher values of capacitance than indicated may be used, but the effective plate-supply impedance may have to be increased to prevent exceeding the maximum rating for peak plate current. o If hot switching is regularly required in operation, the use of choke-input circuits is recommended. AC PLATE SUPPLY VOLTS (RMS) PER PLATE (WITHOUT LOAD) 275 ma.... .74 ms...... 137.5 ma TYPE 5BC3 EF*5 VOLTS AC õ 200 SSRSTMAILLIM TUTTUO DO

MAXIMUM OPERATING VALUES WITHI

RATING CHART

CAPACITOR-INPUT FILTER

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

Miniature type used as combined whf mixer ploying series-connected heater atrings. Outline and oscillator tube in television receivers em-8B, OUTLINES SECTION. Tube requires min-4.7; amperes, 0.6; warm-up time (average), 11 igture nine-contact socket. Heater voits (ac/dc)

8600 μmhos; plate ma., 18; plate dissipation, 2.5 mar watts. Pentode unit: plate supply volts, 250 (300 max); grid-No.2 supply volts, 110 (300 max); grid-No.2 supply volts, 110 (300 max); grathode-bias resistor, 68 ohms; plate resistance (approx.), 0.4 megobm; transconductance, 5200 μmhos; plate ma., 10; grid-No.2 ma., 35; plate dissipation, 2.8 max watts; grid-No.2 input, 0.5 max watt. This type is used principally for renewal purposes. bias resistor, 56 ohms; amplification factor, 40; plate resistance (approx.), 5000 ohms; transconductance, seconds. Characteristics of triode unit as class A1 amplifier: plate supply volts, 150 (300 max); cathode-

Rolated type: 68K7B

coupled cathode-drive rf amplifier cir-Miniature type used in directcuits of vhf television tuners utilizing series-connected heater strings. Outline 8B, OUTLINES SECTION.

Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6BK7-B.

Related type:

0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6CG8-A. dc), 4.7; amperes,

MEDIUM-MU TWIN TRIODE

Miniature type used in directcuits of whi television tuners employing series-connected heater strings. coupled cathode-drive rf amplifier cir-Outline 8B, OUTLINES SECTION.

Related types: 48Q7A, 68Q7A

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Heater volts (ac/dc), 5.6; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6BQ7-A.

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-

5BR8 Related type: **69RBA**

Miniature type used in a wide black-and-white television receivers employing series-connected heater variety of applications in color and strings. Outline 8B, OUTLINES SEC-

TION. Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6BRS-A.

SHARP-CUTOFF PENTODE TWIN DIODE

cations in television receivers employing series- Kp, 202 connected heater strings. The pentode unit is pliffer, or reactance tube. The diode unit is used in sutomatic-frequency-control and detec-Ministure type used in a variety of applitor circuits. Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), 4.7; amperes, 0.6; warmused as an if amplifier, video amplifier, age am-

miniature nine-contact socket. Characteristics of pentode unit as class A1 amplifier: plate supply volts, 200 (300 maz); grid-No.2 supply volta, 150 (300 maz); cathode-bias resistor, 180 ohms; plate resistance (approx.), 0.3 megohm; transconductance, 6200 mmhos; plate ma., 9.5; grid-No.2 ma., 2.8; plate disipation, 2 maz watter grid-No.2 input, 0.5 maz watt, Maximum diode plate ma. (each unit), I maz. up time (average), 11 seconds. Tube requires This type is used principally for renewal purposes.

SHARP-CUTOFF PENTODE TWIN DIODE-

5BW8 Related type: **9**M8

٥ receivers employing series-connected heater strings. The pentode unit is keep limiter, and age keyer. The diodes are Miniature type used in television used as a sound if amplifier, sound

used as horizontal phase detectors. Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6BW8.

heater strings. Outline 8B, OUT-LINES SECTION. Heater volts (ac/ Miniature type used as combined oscillator and mixer tube in television eceivers employing series-connected SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-

= Technical Data ==

6CL8A, 19CL8A **5CL8A** Related type: **2CL8**

amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, types 5CL8 and 5CL8-A are identical with miniature types 6CL8 and 6CL8-A, respectively. Type 5CL8 is a DISCONTINUED type listed for reference only. SECTION. Heater volts (ac/dc), 4.7; **€**

heaterstrings. Outline 8B, OUTLINES

(e)

ij

Miniature types used as combined whf oscillator and mixer in television receivers employing series-connected

SHARP-CUTOFF TETRODE

MEDIUM-MU TRIODE—

HIGH-MU TRIODE-

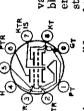


a video amplifier, an age amplifier, or as Miniature type used in television receivers employing series-connected heater strings. The pentode unit is used as an intermediate-frequency amplifier,

Related type:

a reactance tube. The triode unit is used in sweep-oscillator, sync-separator, syncclipper, and phase-splitter circuits. Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), 4.7; amperes, 0.6. Except for heater ratings, this type is identical with miniature type 6CM8.

SHARP-CUTOFF TETRODE MEDIUM-MU TRIODE



strings. The tetrode unit is used as a Miniature type used in a wide variety of applications in color and black-and-white television receivers employing series-connected heater

Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical mixer or amplifier and the triode unit is used in oscillator and rf amplifier circuits. with miniature type 6CQ8.

BEAM POWER TUBE



Miniature type used as vertical deflection amplifier and as audio output tube in television and radio receivers employing series-connected heater strings. Outline 8E, OUTLINES SEC.

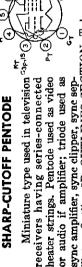
6CZ5

TION. Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6CZ5.

HIGH-MU TRIODE—

5DH8

Miniature type used in television 35receivers having series-connected



miniature nine-contact socket and may be operated in any position. Heater volts arator, or vertical oscillator. Outline 8B, OUTLINES SECTION. Tube requires (ac/dc), 5.2; amperes, 0.6; heater warm-up time (average), 11 seconds.

CLASS A AMPLIETED

CLASS At AMPLINER Maximum Ratings. (Design-Maximum Values):	Triode Unit	Pentode Unit	
PLATE VOLTAGE GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE	300 max	300 max 300 max	volta
Grid-No.2 Voltage. Grid-No.1 (controll-grid) Voltage, Posttive-bias value. Parte Dissiration.	0 max 2.0 max	See curve page 70 0 max volts 2.2 max watts	page 70 volts watts
GRID-NO.2 INPUT: For grid-No.2 voltages up to 150 volts For grid-No.2 voltages between 150 and 300 volts	1 1	0.55 max watt See curve page 70	watt page 70
Prax Heatene-Carabos Voltrags: Heater negative with respect to cathode Heace positive with respect to cathode	$200~max\\200~max$	200 max 200°max	volts volts
Characteristics: Plate Supply Voltage Grid-No.2 Supply Voltage Grid-No.2 Supply Voltage Grid-No.2 Current. Plate Current. Amplification Factor Plate Resistance (Approx.) From plate current of 10, 44.	Triode Unit Pentode Unit 250 125 390 125 7.3 13.5 53 8 60.012 0.15 4400 8600	Pentode Unit 125 125 126 13.5 3.8 0.15 8600 -6	volts volts ohms ma ma megohm megohm volts

Maximum Circuit Values:

0.5 max 0.1 max
žrid-No.1-Circuit Resistance: For fixed-bias operation: For catbode-bias operation:

VERTICAL DEFLECTION OSCILLATOR

		rot offerment in a restrict, so there are	
ximum R	atings,	ximum Ratings, (Design-Maximum Values):	•
PLATE V	OLTAGE	Plate Voltage	
AK NEGAS	rive-Pu	AR NEGATIVE-PULSE GRID VOLTAGE	

DC Plate Voltage
Peak Cathode Curred Grid Voltage
Peak Cathode Current
Average Cathode Current
Plate Cathode Current
Plate Heaver-Cathode
Peak Heaver-Cathode Voltage
Heater negative with respect to cathode
Heater positive with respect to cathode Grid Circuit Resistance:

volts volts

200 max 200° max

2.2 max megohma

The dc component must not exceed 100 volts For fixed-bias, cathode-bias, or grid-resistor-bias operation....

ma watt

olta

300 max 400 max 35 max 12 max 1 max

Triode Unit

FULL-WAVE VACUUM RECTIFIER

20.0

ply of radio and television receivers having high de requirements. Outline Glass octal type used in power sup-19D, OUTLINES SECTION, Tuberequires octal socket; operation in ver-

tical position is preferred, but horizontal operation is permissible if pins 2 and 4

126

are in vertical plane. It is especially important that this tube, like other powerhandling tubes, be adequately ventilated. Filament volts (ac/dc), 5; amperes, 3.

FULL-WAVE RECTIFIER

Maximum Ratings, (Design-Maximum Values):

= Technical Data =

1700 max volts
1 max ampere
5 max amperes
See Rating Chart
See Rating Chart

peak inverse flate voltage.
Peak Flate Gurrit (Fet Plate)
Hot-Switching Transient Plate Currin (Fet Plate)
AC Plate-Supely Voltage (Pet Plate, tins, without load).
DG Output Currient (Pet Plate).

henries ohms volta

10 420 275 1100

900

600

Typical Operations Filter Input

Capacitor

ma

impedance should be

67 460 275 Filter-Input Capacitor.

Filter-Input Communication

Filter-Input Capacitor.

Effective Plate-Supply Impedance per Plate.

21

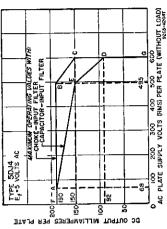
BC Output Voltage at Input to Filter (Approx.).

290

DC Output Current.

300 DC Output Voltage at Input to Fi DC Output Current.......

RATING CHART



SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

Miniature type used as combined oscillator and mixer in television receivers employing series-connected heater strings and operating at inter-

©

S2P(3)

megohm megohm

0.25 max 1.0 max

Related types: **SEA8, 19EA8**

peres, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this ri Cfr mediate frequencies in the order of 40 megacycles. Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), 4.7; amtype is identical with miniature type 6EA8.

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-

A connected series connected Miniature type used as combined heater strings. Outline 8B, OUTLINES oscillator and mixer in television re-SECTION. Heater volts (ac/dc), 4.7;

5EU8 Related type: **6EU8**

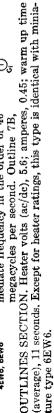
amperes, 0.6; warm-up time (average), 11 seconds. Cathode warm-up time (time required for the transconductance to reach 6500 µmhos when the tube is operated 35 seconds. Except for heater ratings and cathode warm-up characteristic, this rom a cold start with dc plate volts=100, grid volts=0, and heater amperes=0.560), ype is identical with miniature type 6EU8. ⊙[®]

SHARP-CUTOFF PENTODE

5EW6

Related types: 4EW6, 6EW6

mediate frequency in the order of 40 Miniature type used in the gaincontrolled picture-if stages of vhf television receivers operating at an inter-



MEDIUM-MU TRIODE—

SHARP-CUTOFF PENTODE

Related 1ype:

vision receivers employing series-con-Miniature type used as combined oscillator and mixer tube in whi telenected heaterstrings. Outline 8B, OUT-LINES SECTION. Heater volts (ac/

0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6FG7. dc), 4.7; amperes,

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

Related type:

Miniature type used as combined vertical deflection oscillator and general-purpose or if amplifier in television heaterstrings.Outline8B,OUTLINES receivers employing series-connected

SECTION. Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6FV8.

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

5GH8 Related type: 6GH8

Miniature type used in multivibrator-type horizontal-deflection circuits in television receivers employing a series heater-string arrangement. Also used for age-amplifier or sync-separa-

€25 3

tor applications in such receivers. Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6GH8.

SEMIREMOTE-CUTOFF PENTODE

5GM6 6GM6

mediate frequencies in the order of 40 Miniature type used in gain-controlled picture-if stages of television receivers employing series-connected heater strings and operating at inter-

peres, 0.5; warm-up time (average), 11 seconds. Except for heater ratings, this megacycles. Outline 7B, OUTLINES SECTION. Heater volts (ac/dc), 5.6; amtype is identical with miniature type 6GM6.



SHARP-CUTOFF PENTODE

== Technical Data =

Miniaturetype used for FM soundaudio-voltage driver. Tube has two detector service in locked-oscillator, quadrature-grid FM detector circuits, as combined detector, limiter, and

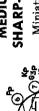
5000

independent control grids, and has controlled heater warm-up time for use in receivers employing series-connected heater strings. Outline 7B, OUTLINES SEC-TION. Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6GX6. 5J6 Related types: 6J6, 19J6 9X59

MEDIUM-MU TWIN TRIODE

Miniature type used as combined LINES SECTION. Heater volts rf power amplifier and oscillator in television receivers employing series-connected heaterstrings. Outline 7B, OUT-

(ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6J6.



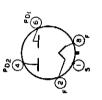
SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

Miniature type with frame-grid pentode unit used as combined oscillator-mixer tube in television receivers using an intermediate frequency in the order of 40 megacycles and employing

telated type:

6KE8

series-connected heater strings. Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), 5.6; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6KE8.



FULL-WAVE VACUUM RECTIFIER

Metal type used in power supply of radio equipment having large dc requirements. Out-line 6, OUTLINES SECTION. Tube requires ferred but horizontal mounting is permissible if volts (ac), 5.0; amperes, 2.0. Maximum ratings 1550 max; peak plate ma. (per plate), 675 max; de output ma., 225 max. This type is used prinpins 2 and 4 are in vertical plane. Filament as full-wave rectifier: peak inverse plate volts, octal socket. Vertical tube mounting is precipally for renewal purposes.

		voite	1	ohme	henries	am.		volts	voits		volta
	Choke	1100	1	1	10	225		466	450	;	91
	Capacitor	006 .	₹.	. 150	ı	225		. 539			£
Typical Operation:	Filler Input	AC Plate-to-Plate Supply Voltage (rms)	Filter-Input Capacitor	Total Effective Plate-Supply Impedance Per Plater	Filter-Input Choke	DC Output Current	DC Output Voltage at Input to Filter (Approx.):	At half-load current (112,5 ma.)	At full-load current (225 mg.)	Voltage Regulation (Approx.):	Half-load to full-load current

Related types:

Miniature type used as combined cozal AM detector, FM detector, and af voltage amplifier in radio and television receivers employing series-con-

must not exceed 100 volts. Except for heater and heater-cathode ratings, this type (average), 11 seconds. Peak heater-cathode volts, 200 max. When the heater is OUTLINES SECTION. Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time positive with respect to the cathode, the dc component of the heater-cathode voltage nected heater strings. Outline 8B, is identical with miniature type 6T8-A. 6T8A, 19TB



ers having high dc requirements. Type Glass octal types used in power supplies of radio and television receiv-FULL-WAVE VACUUM RECTIFIER

length, 5-5/16 inches; seated height, 4-3/4 inches; diameter, 5U4-GB, Outline 19D, OUTLINES SECTION. Type 5U4-G maximum

5U4GB

504G

missible if pins 1 and 4 are in vertical plane. The coated filament is designed to refer to INTERPRETATION OF TUBE DATA. Maximum ratings for type 5U4-G as full-wave rectifier: peak inverse plate volts, 1550 max; peak plate amperes 2-1/16 inches. Tubes require octal socket. Either type may be supplied with pins ment terminals should be 5.0 volts at an average line voltage of 117 volts. It is especially important that these tubes, like other power-handling tubes, be adequately ventilated. For discussion of Rating Chart and Operation Characteristics, per plate, 0.8 max (transient, 4.0 max). Type 5U4-G is used principally for renewal 3, 5, and 7 omitted. Vertical mounting is preferred but horizontal mounting is peroperate from the ac line through a step-down transformer. The voltage at the filapurposes. Filament volts (ac), 5; amperes, 3. mensions: over-all

FULL-WAVE RECTIFIER

Peak Inverse Plate Voltage.

Peak Plate Current (Per Plate).

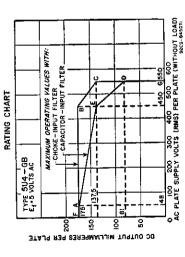
Hot-Swiching Transient Plate Current (Per Plate).

AC Plate Supelix Voltage (Per Plate, fins).

DC Outfut Current (Per Plate). Maximum Ratings, (Design-Center Values):

Sering O	
296	
:	
:	
:::	
:::	
:::::	
	See Lacing O

hart olts Sere



	640 640 640
to Filler:	600 21 21
Typical Operation of 5U4-GB with Capacitor Input to Filter:	AC Plate-to-Plate Supply Voltage (rms)

volts µf ohms

84 84 85

		ř.	
1 1 68 630	20	1100 10 - 455	440 15
520 - - 460	9	900 10 355	340 - 15
DC Output Voltage at Input to Filter (Approx.): 335 At half-load current of 137,5 ma = 31 ma = 290 At full-load current of 275 ma = 162 ma = 290	Voltage Kegulation (Approx.): Half-load to full-load current	Typical Operation of 5U4-GB with Choke Input to Filter: AC Plate-to-Plate Supply Voltage (rms) Filter-Input Choke DC Output Voltage at Input to Filter (Approx.): At half-load current of 137,5 ma	At full-load current of 248 ma. Voltage Regulation (Approx.): Half-load to full-load current

#If hot switching is regularly required in operation, the use of choke-input circuits is recommended. Such circuits limit the hot-switching current to a value no higher than that of the peak plate current. When capacitor-input circuits are used, a maximum peak current value per plate of 4.6 amperes during the initial cycles of the hot-switching transient should not be exceeded. nlv impedance

volts

volts volts

volts enries

volts

volts

a state of s

= Technical Data

mper		
Higher values of capacitance than indicated may be used, but the enective plate-supply imper	nay have to be increased to prevent exceeding the maximum rating for peak plate current.	
errective	for peak	
out the	n rating	
be used,	maximur	
1 may	ng the	
ndicated	exceedi	
e than i	prevent	
acitane	ssed to	
oi cap	incres	
values	e to be	
Higher	nay hav	

TYPE 5U4-GB ### ### ### ### #### ###############	C= 164 f		Ä		00 400 400 400 400
TYPE 5U4-GB E-50.NOCUTS AC SUBDLY FREQUENCY=80CB EDMC-DASH LINES=CHOKES OF INFINITE EDMC-DASH LINES=SOUNDARY LINES FOR SHORT-DASH CURVES STORE FOR REPORT AND TO THE SHOWN SHORT-DASH CURVES SHEGOLIATION CURVES FOR REPORT AND TO THE SHEGOLIATION CURVES CURRENT—AND TO THE SAME AS SHOWN ON ARTING CHARN IS THE SAME AS SHOWN ON ARTING CHARN	AS SHOWN C		RMS PER PLATE	500	200 300 200 MILLIAMPERES
TYPE SU4-GB E4-50 VOLTS AC SOLID-LINE CUNY LONG-DASH LINE SHORT-DASH CUR CURRENT-AND-VC		3	15 To 17		\$ 8 \$
1 1 1		ASTLITER &	14 2T 10	v TugTuo	
ANGE		PPILTER OT TUGI		v Tugtuo	DC 400
THE SULP OF THE SU		PPUT TO FILTER		V TUATUO	DC

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-

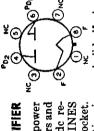
Miniature type used as combined oscillator and mixer tube in AM/FM receivers and television receivers employing series-connected heater strings.

Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6U8-A. Outline 8B, OUTLINES SECTION

Related types: 6USA, 9USA 508

FULL-WAVE VACUUM RECTIFIER

other equipment having high dc requirements. Outline 19D, OUTLINES Glass octal types used as power supply in color television receivers and SECTION. Tubes require octal socket.



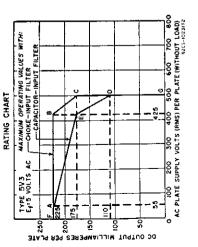
ertical mounting is preferred, but horizontal mounting is permissible if pins 2 nd 4 are in vertical plane. It is especially important that these tubes, like other ower-handling tubes, be adequately ventilated. For discussion of Rating Chart, efer to INTERPRETATION OF TUBE DATA, Type 5V3 is a DISCONTINUED ypelisted for reference only. Filament volts (ac/dc), 5; amperes, 3.8 (5V3), 3(5V3-A).

FULL-WAVE RECTIFIER

	51/3	5V3-A	
Datient Daties	Design-	Design-	
ם אושתש אם וותפני	Center Values Maximum Values	Maximum Va	lues
EAK INVERSE PLATE VOLTAGE.	1400 max	1550 max	volts
BAK PLATE CURRENT (Per Plate)	1.2 max	1.4 max	amperes
or-Switching Transient Plate Current (Per Plate)	5.5 max	6.6 max	amperes
C PLATE-SUPPLY VOLTAGE (Per Plate, rms, without load) See Rating	See Rating	550 max	volts
C OUTPUT CURRENT (Per Plate)	Chart	415° max	ma
With capacitor-input filter for ac plate-supply voits (rms. per plate, without load) = 470.	plate, without	load) = 470.	

rpical Operation:	573	5V3-A	
Filter Input	Capacitor Choke	Capacitor Choke	
C Plate-to-Plate Supply Voltage (rms).	850 1000	850 1000	volts
liter-Input Capacitor	- 40	- 04	Ĭ
fective Plate-Supply Impedance per Plate.	- 99	- 20	ohms
inimum Filter-Input Choke	- 10	- 10	henries
C Output Current.	350 350		E
C Output at Input to Filter (Approx.)		440 390	volts
haracteristics:	51/3	5V3-A	
ube Voltage Drop for plate current of 350 ma (per plate)	47	42	volts
When capacitor values greater than 40 of are used, the effective plate-supply impedance should be	fective plate-s	upply impedance s	hould be

volt	d blu
	shot
	ance
42	m pec
	ilα.
	eded
47	plate
	tive s not
:	effec enti
plate	curr
(per	used plate
ma	are eak
f 350	40 m for p
ent o	than ting
curr	ater (
plate	grea Ximt
for	alue e ma
be Voltage Drop for plate current of 350 ma (per plate)	When capacitor values greater than 40 μ f are used, the effective plate-supply impedance should b creased so that the maximum rating for peak plate current is not exceeded.
age]	apaci Both
Volt	en ca
þe	Υ. Fe



5V4G

FULL-WAVE VACUUM RECTIFIER

5V4GA

tively, OUTLINES SECTION. Tubes Glass octal types used in full-wave power supplies having high de requirements, Outlines 26 and 19A. respecrequire octal socket and may be

step-down transformer. The voltage at the heater terminals should be 5.0 volts nounted in any position. The heater is designed to operate from the ac line through

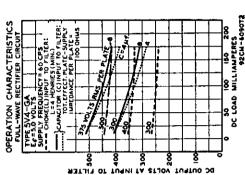
= Technical Data =

under operating conditions at an average line voltage of 117 volts. It is especially important that these tubes, like other power-handling tubes, be adequately ventilated. Heater volts (ac/dc), 5; amperes, 2.

FULL-WAVE RECTIFIER

Maximum Ratings, (Design-Center Values):				
Prak Inverse Plate Voltage. AC Plate-Supply Voltage (Per Plate, fire):		1460 maz	volts	
With capacitor-input filter. With choke-input filter		375 maz 500 maz	volts volts	
Peak Plate Current (Per Plate) DC Output Current		525 max 175 max	801 8	
Typical Operation: Niles Isolate Conneitor		Shoke		
AC Plate-to-Plate Supply Voltage (rms)	•	0001	volts	
Filter-Input Capacitor* 10 Total Effective Plate, Supply Imposement Plate 100		1 1	a de	
Filter-Input Choke		4	henries	
DC Output Voltage at Input to Filter (Approx.) for de output	7	410	volte	

*Higher values of capacitance than indicated may be used, but the effective plate-supply impedance may have to be increased to prevent exceeding the maximum rating for peak plate current.



BEAM POWER TUBE

Glass octal type used as output amplifier in television receivers employing series-connected heater strings. Outline 14C, OUTLINES SECTION.

5066

Related types: 6V6GT, 12V6GT This type may be supplied with pin

seconds. Except for heater ratings, this type is identical with glass octal type 6V6-GT. No.1 omitted, Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 FULL-WAVE VACUUM RECTIFIER



Metal type 5W4 and glass-octal type 5W4-GT are used in power supply of radio equipment respectively, OUTLINES SECTION. Both types require octal socket. Filament volts (ac), 5.0; amperes, 1.5. Maximum ratings: peak inhaving low de requirements, Outlines 5 and 14D

verse plate volts, 1400 max; peak plate ma., 300 max; dc output ma., 100 max. These are DIS-CONTINUED types listed for reference only.

5W4GT 5W4

FULL-WAVE VACUUM RECTIFIER

Glass octal type used in power supply of radio equipment having large de requirements.



volts ohms

588

= Technical Data

volta volta volta

610 200

390

After input Capacitor*

Effective Plate-Supply Impedance per Plate
DC Output Voltage at Input to Filter (Approx.):

At half-load current of 42 ma

ypical Operation of 5Y3-GT with Capacitor Input to Filter:

AC Plate to Plate Supply Voltage (rms).....

volte benries volts volts voite ote Pote

80 100

> 270 246

> > 62.5 ma

Voltage Regulation (Approx.): Half-load to full-load current....

150 ma

At full-load current of At half-load current of

volta

50

\$

'ypical Operation of 5Y3-GT with Choke input to Filter:

Voltage Regulation (Approx.):
Half-load to full-load current.....

At full-load current of

AC Plate-to-Plate Supply Voltage (rms)
Filter Input Chokes#
DC Output Voltage at Input to Fliter (Approx.):
At half-land current of \(\)

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

Miniature type used as combined oscillator and mixer in AM/FM receivers and television receivers em-

ploying series-connected heater strings. Outline 8B, OUTLINES SECTION. Related types: 6X8, 19X8

This value is adequate to maintain optimum regulation in the region to the right of line L=10H on curve OPERATION CHARACTERISTICS with Choke Input to Filter, provided the load currents are not less than 35 ma,, and 50 ma,, respectively, for Plate-to-Plate supply voltages of 700 and 1000

OPERATION CHARACTERISTICS

OPERATION CHARACTERISTICS FULL - WAVE CIRCUT, CAPACITOR INPUT TO FILTER

volts (rms)

current.

E. 5.0 VOLTS AC FILTER-INPUT CAPACITOR

TYPE 5Y3-GT

ğ

TOTAL EFFECT PLATE-SO CURVES

140 OHMS FOR CURVES 6-8 ADK = SEE RATING

PLATC

ş

* Higher values of capacitance than indicated may be used but the effective plate supply impedance may have to be increased to prevent exceeding the maximum rating for hot-switching transient plate

1283

cept for heater rating, this type is identical with miniature type 6X8.

FULL-WAVE VACUUM RECTIFIER

5Y3GI **5** Y 3 G

erate de requirements. Type 5Y3-G, Outline 26, type 5Y3-GT, Outline 14D, supply of radio equipment having mod-

tubes, like other power-handling tubes, be adequately ventilated. For disc verse plate volts, 1400 max; peak plate ma. per plate, 375 max. Type 5Y3-DISCONTINUED type listed for reference only. Filament volts (ac), 5; amp missible if pins 2 and 8 are in horizontal plane. It is especially important that TUBE DATA. Maximum ratings for type 5Y3-G as full-wave rectifier: pe of Rating Chart and Operation Characteristics, refer to INTERPRETATIO octal socket. Vertical tube mounting is preferred, but horizontal mounting



Maximum Ratings, (Design-Center Values):

See Ratin 1400 max 440 max 2.5 max 5 YS-GT PEAK INVERSE PLATE VOLTAGE.
PEAK PLATE CURRENT (Per Plate)
HOT-SWITCHING TRANSINT PLATE CURRENT (Per Plate)
AC PLATE SUFFLY VOLTAGE (Per Plate, rins)
DC OUTPUT CURRENT (Per Plate)

_		
is per-	t these cussion ON OF eak in-G is a eres, 2.	volts ma amperes og Chart og Chart

я**зт**лія 8

VAVE CIRCUIT, CHOKE INPUT TO FILTER	OKES OF VALUE	CHOKE VALUES SHOWN	CHART	NWO VS SHOWN TIBLE	3/2			4000VARMS PER PLATE				1/2/2	 40 BO 120 16 DC LOAD MILLIAMPERES 92CM-7394T	
- 17			009	3	500	大:	1		TUAT	25002 5	100 001	188	_	

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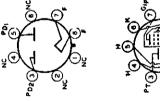
supplies of radio equipment having moderate DC requirements. Outlines LINES SECTION. Tubes require oc-Glass octal types used in power 26, 14D, and 19D, respectively, OUT-FULL-WAVE VACUUM RECTIFIER 92CM-7395T

40 00 MILLIAMPERES

5Y4GA 5**Y4**G

tal socket. Type 5Y4GT is supplied

Maximum dimensions: over-all length, 5-5/16 as full-wave rectifier; peak inverse plate volts, 1550 max; peak plate amperes per plate, 675 max. Type 5X4-G is used principally for reinches; seated height, 4-3/4 inches; diameter, Tube requires octal socket. Maximum ratings 2-1/16 inches. Filament volts, 5.0; amperes, 3.0. newal purposes



Heater volts (ac/dc), 4.7; amperes, 0.6; warm-up time (average), 11 seconds. Ex-

Glass octal types used in power

OUTLINES SECTION. Tubes require

MAXIMUM OPERATING VALUES WITH-IOKE-INPUT FILTER RATING CHART TYPE 5Y3 - GT 65 ន OUTPUT MILLIAMPERES PER PLATE

O 100 200 300 400 500
AC PLATE SUPPLY VOLTS (RMS) PER PLATE (WITHOUT LOAD)

ing is permissible: if pins 2 and 7 are in horizontal plane (5Y4-G); if pins 1 and 4 are in vertical plane (5Y4-GA); if pins 2 and 3 are in vertical plane (5Y4-GA). It is with pins 4 and 6 missing. Vertical tube mounting is preferred, but horizontal mountventilated. For discussion of Rating Chart, refer to INTERPRETATION OF TUBE DATA. Maximum ratings for type 5Y4-G as full-wave rectifier; peak inespecially important that these tubes, like other power handling tubes, be adequately verse plate volts, 1400 max; peak plate ma. per plate, 375 max (transient amperes, 2.2 max). Type 5Y4-G is a DISCONTINUED type listed for reference only. Filament volts (ac/dc), 5; amperes, 2.

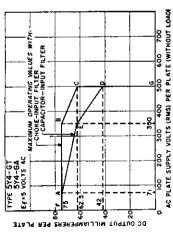
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Maximum Ratings, (Design-Center Value):

400 max volts 400 max ma 2.2 max amperes See Rating Chart See Rating Chart	volts µf obms henries	Voits
1400 max 400 max 2.2 max See Rat See Rat	Choke 1000 - 10 125	390
	Capacitor 700 10 50 125	350
PEAK INVERSE PLATE VOLTAGE PEAK PLATE CURRENT (PER PLATE CURRENT HON-SWITCHING TARNOTE PLATE CURRENT AC PLATE SUPELY VOLTAGE (PER PLACE, FIRS) DC OUTFUT CURRENT (PER PLACE)	Iypical Operation of 574-GA & 574-GT. Riller Input AC Plate-to-Plate Supply Voltage (rms) Filter-Input Capacitor Total Effective Plate-Supply Impedance per Plate Filter-Input Coleke. DC Output Current DC Output Current DC Output Current	At full-load current (125 ma.)

Characteristics, Instantaneous Value:

volts	e is in-
99	pply impedanc
Tube Voltage Drop for plate current of 125 ma (per plate)	$^{\circ}$ Values of capacitance greater than 20 μl may be used, provided the plate-supply impedance is increased to prevent exceeding the maximum peak-plate-current rating.
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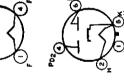
FULL-WAVE VACUUM RECTIFIER

equipment having large de requirements. Out-line 28, OUTLINES SECTION, Tube requires four-contact socket. Vertical mounting is pre-(ac), 5.0; amperes, 3.0. Maximum ratings as full-wave rectifier: peak inverse plate volts, 1550 max; peak plate ma. per plate, 675 max. Type Glass type used in power supply of radio ferred but horizontal mounting is permissible if pins I and 4 are in horizontal plane. Filament volts

FULL-WAVE VACUUM RECTIFIER

5Z3 is used principally for renewal purposes.

of radio equipment having moderate LINES SECTION. Tube requires Metal type used in power supply octal socket and may be mounted in de requirements. Outline 5, OUT-



any position. Heater volts (ac), 5.0; amperes, 2.0. Maximum ratings: peak inverse plate volts, 1400 max; peak plate ma. per plate, 375 max. Typical operation as fullwave rectifier with capacitor-input filter: ac plate-to-plate supply volts (rms), 700; total effective plate-supply impedance per plate, 50 ohms; de output ma., 125. Pypical operation with choke-input filter: ac plate-to-plate supply volts, 1000; minimum filter-input choke, 5 henries; de output ma., 125.

= Technical Data ==

POWER TRIODE

Tube requires four-contact socket. Filament volts (ac/dc), 6.3; amperes, 1.0. This type is identical electrically with type 6B4-G. Type 6A3 is a DISCONTINUED type listed for reference Glass type used in output stage of radio receivers. Outline 28, OUTLINES SECTION

6A3

6A6

HIGH-MU TWIN POWER TRIODE

Glass type used in output stage of ac-operated receivers as a class B power amplifier or with units in parallel as a class A₁ amplifier to drive a 6A6 as class B amplifier. Outline 27, OUTLINES SECTION. Tube requires medium seven-contact (0.855-inch, pin-circle diameter) socket. Filament volts (ac/dc), 6.3; amperes, 0.8. This type is electrically identical with type 6N7. Type 6A6 is a DISCONTINUED type listed for reference only.

PENTAGRID CONVERTER

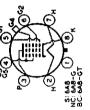
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These types require the small seven-contact (0.75-inch, pin-circle diameter) socket. Except for interelectrode capacitances, the 6A7 is identical electrically with type 6A8. Type 6A7S, now Glass types used in superheterodyne cirnected to cathode. In general, its electrical characteristics are similar to those of the 6A7, but cuits. Outline 24B, OUTLINES SECTION. DISCONTINUED, has the external shield con-

6A7S

the two types are usually not directly interchangeable. Type 6A7 is used principally for renewal purposes.

PENTAGRID CONVERTER



quire octal socket. Heater volts (ac/dc), 6.3; amperes, 0.3. Characteristics as coverter: plate volts, 100 Metal type 6A8 and glass octal types 6A8-G and 6A8-GT used in superheterodyne circuitu. 6A8 Outline 3, 6A8-G Outline 23, 6A8-GT and grid-No.2-supply volts, 250 (300 max); max; grid-No.4 (control-grid) volts, -3 (0 max); Outline 15A, OUTLINES SECTION. Tubes re-(screen-grid) grids-No.3-and-No.5

6A8G 6A8GT Related type:

12A>

6A8

resistor, 50000 ohms; plate resistance (approx.), 0.36 megohm; conversion transconductance, 550 mmbos; plate ma., 3.5; grids-No.3-and-No.5 ma., 2.7; grid-No.2 ma., 4; grid-No.1 ma., 0.4; total cathode na., 10.6 (14 max); plare dissipation, 1 max watt; grids-No.3-and-No.5 input, 0.3 max watt; grid-No.2 input, 0.75 max watt; peak heater-cathode volts, 90 max. These types are used principally for renewal grid-No.2 (anode-grid) resistor, 20000 ohms (bypassed by 0.1-uf capacitor); grid-No.1 (oscillator-grid)

HIGH-MU TRIODE

or oscillator at frequencies up to about drive amplifier, frequency converter, 300 megacycles per second particularly in television and FM receivers. Outline Miniature type used as cathode-

7B, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.15. For maximum ratings, characteristics, and curves, refer to type 12AT7.

visually by means of a fluorescent target the effects of a change in a controlling voltage. It is sions: over-all length, 4-3/16 inches; seated height, 3-9/16 inches; diameter, 1-3/16 inches. Glass type with triode unit used to indicate used as a convenient means of indicating accurate radio-receiver tuning. Maximum dimen-



ELECTRON-RAY TUBE

Tube requires six-contact socket, Heater volts (ac/dc), 6.3; amperes, 0.15. Maximum ratings

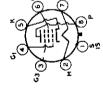


1 indicator service: triode-plate supply volts, 180 max; fluorescent-target volts, 180 max, 125 min.

SHARP-CUTOFF PENTODE

his type is used principally for renewal purposes.

0.45. Maximum ratings as class A₁ amplifier: plate and grid-No.2 supply volts, 300 max; Metal type used in rf and if stages of picture amplifier of television receivers particularly those employing automatic-gain control. Outline 2, OUTLINES SECTION. Tube requires octal socket. Heater volts (ac/dc), 6.3; amperes, grid No.3, connect to cathode at socket; grid-

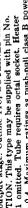


tion: plate and grid-No.2 supply volts, 300; grid-No.3 volts, θ; grid-No.2 series resistor, 36000 ohms; rid-No.1 volts, -3; plate resistance (approx.), θ.7 megohm; transconductance, 5000 μmhos; grid-No.1 volts for transconductance of 50 μmhos, grid-No.1 volts for transconductance of 50 μmhos, -22.5; plate ma., 12.5; grid-No.2 ma., 3.2. This type is used No.2 volts, 200 max; plate dissipation, 3.75 max watts; grid No.2 input, 0.65 max watt. Typical oper-

principally for renewal purposes.

HIGH-MU POWER TRIODE

the direct-coupled type in which a driver tube develops positive grid bias for the 6AC5-GT output stage. Outline 14C, OUTLINES SEC-Glass octal type used in single-ended or push-pull audio-frequency power amplifiers of



volts (ac/dc), 6.3; amperes, 0.4. Maximum ratings as push-pull class B power amplifier: plate volts, 250 max; peak plate ma., 110 max; average plate dissipation, 10 max watts. This type is used princi-

SHARP-CUTOFF PENTODE

pally for renewal purposes.

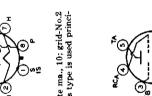
grid-No.2 supply volts, 300 max; grid No.3 con-Metal type used as video amplifier tube in OUTLINES SECTION. Tube requires octal Characteristics as class A₁ amplifier: plate and nected to cathode at socket; grid-No.2 series television receivers, and as a mixer or oscillator tube in low-frequency applications. Outline 2, socket. Heater volts (ac/dc), 6.3; amperes, 0.45.

ohms; plate resistance (approx.), 1 megohm; transconductance, 9000 µmhos; plate ma., 10; grid-No.2 ma., 2.5; plate dissipation, 3 maz watts; peak heater-cathode volts, 90 maz. This type is used princiresistor, 60000 ohms; cathode-bias resistor, 160

pally for renewal purposes.

ELECTRON-RAY TUBE

as a convenient means of indicating accurate radio-receiver tuning. Maximum over-all length, get, the effects of changes in the controlling Glass octal type used to indicate visually, voltages. It is a twin-indicator type and is used 2-7/8 inches; maximum diameter, 1-5/16 inches. Heater volts (ac/dc), 6.3; amperes, 0.15. Maxiby means of two shadows on the fluorescent tarmum target volts, 150. This is a DISCON. TINUED type listed for reference only.



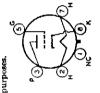
OW-MU TRIODE - POWER PENTODE

= Technical Data



fer circuit in conjunction with type 6F6-G. Triode unit serves as phase inverter. Outline 26, OUTLINES SECTION. Tube requires octal For typical operation of pentode unit, refer to socket. Heater volts (ac/dc), 6.3; amperes, 0.85. type 6F6-G. Maximum ratings of pentode unit as class At or push-pull class AB; amplifier; plate Glass octal type used in a push-pull ampli-

volts, 375 mar; grid-No. 2 volts, 285 mar; prid-No. 2 dots, 285 mar; plate dissipation, 8.5 mar watts; grid-No.2 input, 2.7 mar watts. Maximum ratings of triode unit as classA: amplifier: plate volts, 285 max; plate dissipation, 1.0 max watt. This type is used principally for renewal



LOW-MU TRIODE

Glass octal type used as class A₁ amplifier in ac/de radio receivers. Outline 14C, OUT-LINES SECTION. Heater volts (ac/dc), 6.3; amperes, 0.3. Maximum ratings as class A₁ amplifier: plate volts, 300 maz; plate dissipation, 2.5 max watts. This is a DISCONTINUED type listed for reference only.

TWIN-PLATE CONTROL TUBE

odes with different cutoff characteristics. If ave voltage is applied to the common control grid in suitable circuit, one triode section operates on weak signals while the other operates on strong signals. Heater voltage (ac/dc), 6.3; amperes, 6.15. This is a DISCONTINUED type listed Glass octal type used as a control tube for twin-indicator type electron-ray tubes. Outline 22, OUTLINES SECTION. Contains two trifor reference only.



or as a driver for two type 6AC5-GT tubes in dynamic-coupled, push-pull amplifiers. In the latter service, type 6AE7-GT replaces two tubes ordinarily required as drivers. Outline14C, OUT-LINES SECTION. Heater volts (ac/dc), 6.3; Glass octal type used as a voltage amplifier amperes, 0.5. This is a DISCONTINUED type listed for reference only.

HALF-WAVE VACUUM RECTIFIER

television receivers. Outline 9B, OUT-LINES SECTION. Tube requires miniature nine-contact socket and may be Miniature type used as a damper tube in horizontal deflection circuits of

Related type: 12AF3 mounted in any position. Socket terminals 1, 2, 3, 6, 7, and 8 should not be used as tie points. It is especially important that this tube, like other power-handling tubes, be adequately ventilated. Heater volts (ac/dc), 6.3; amperes, 1.2.

For operation in a 525-line, 30-frame system DAMPER SERVICE

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a \$25-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds. 4500* max 300* max 4500 max 750 max 185 max 210 max PEAK INVERSE PLATE VOLTAGE;
PEAK PLATE CURRENT
AVERAGE PLATE CURRENT
PEAK HEATER CATHODE VOLTAGE:
Heater negative with respect to cathode
Heater pogitive with respect to cathode
BULB TEMPERATURE (At hottest point) Maximum Ratings, (Design-Maximum Values):

volts C

Ë volts

* The de component must not exceed 1000 volts.

6AF4A **6AF4**

Related types: 2AF4B, 3AF4A

MEDIUM-MU TRIODE

oscillators in uhf television receivers covering the frequency range of 470 to 890 megacycles per second. 6AF4 Outline 7B, 6AF4-A Outline 7A, OUT-Miniature types used as local



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LINES	IES SECTION. Tubes req	Tubes	requires	miniature	LINES SECTION. Tubes requires miniature seven-contact	ct socket and	an
mounted	mounted in any position.	ition.					

НЕАТЕВ VOLTAGE (AC/DC). 6.3 ч. НЕАТЕВ СUBRENT. 0.225 апр	Grid to Plate	Grid to Cathode and Heater	Heater to Cathode**
HEATER VOLTAGE (AC/DC)HEATER CURRENT.	DIRECT INTERELECTRODE CAPACITANCES: ** Grid to Plate.	Grid to Cathode and Heater	Heater to Cathode**

* With external shield connected to cathor ** With external shield connected to plate.

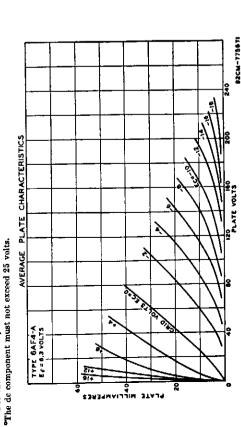
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Characteristics:	Plate Supply Voltage	Cathode-Bias Resistor	Amplification Factor	Plate Resistance (Approx.)	Transconductance	Plate CurrentPlate Current
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volts obms ohms smhos ma

80 150 13.5 2100 6500 17.5

LATE VOLTAGE.	150 max	volts
RID VOLTAGE, Negative-bias value	-50 max	Volts
FRID CURRENT	z max	
PLATE DISSIPATION	2.0 mag	SITEM
OC CATHODE CURRENT.	That was	
Heater negative with respect to cathode	50 max	volts
Heater positive with respect to cathode	50°max	voits
rypical Operation as Oscillator at 1000 Mcs		

50 max volts 50°max volts	100 volts 220 obms 10000 obms 17 ma	Not recommended 0.5 max megohm
Feat that ize / Annoy, Feat to cathode. Heater positive with respect to cathode. Heater positive with respect to cathode.	Typical Operation as Oscillator at 1000 Mc: Plate Supply Voltage. Plate Resistor Grid Resistor. Plate Current (Approx.)	Maximum Circuit Values: Grid-Circuit Resistance: For fixed-bias operation. For eathode-bias operation.



= Technical Data =

ELECTRON-RAY TUBE

Glass octal used to indicate visually, by means of

as a convenient means of indicating accurate target, the effects of changes in the controlling voltages. It is a twin-indicator type and is used radio-receiver tuning. Maximum over-all length, two shadows on the fluorescent 2-5/16inches; maximum diameter, 1-5/16inches.

mcd - dk This type may be supplied with pin No.1 omitted. Tube requires octal socket. Heater volts (ac/dc), 6.3; amperes, 0.15. Maximum ratings in indicator service; fluorescent-target volts, 250 max, 125 min; ray-control-electrode supply volts, 250 max; 6AF6G

ma., 3.75; ray-contact-electrode volts (approx. for 0° shadow angle), 155; ray-control-electrode volts (approx. for 100° shadow angle), 0. peak heater-cathode volts, 90 maz. Typical operation: fluorescent-target volts, 250; fluorescent-target Duodecar type used in a variety The high-mu triode unit is used for age keyer service, the medium-mu triode of applications in television receivers. SHARP-CUTOFF PENTODE DUAL TRIODE ₹<u>@</u>

Related type: 15AF11 unit for sync separator service, and

CLASS A. AMBILISED

Tube requires duodecar twelve-contact socket and may be mounted in any posi-

tion. Heater volts (ac/dc), 6.3; amperes, 1.05.

the pentode unit for video amplifier service. Outline 12C, OUTLINES SECTION.

CLASS A, AMPLIMER	AMPLIFIER				
	Triode	Triode	Pentode		
Maximum Ratings, (Design-Maximum Values):	Unit No. 1	Unit No.2	Unit		
PLATE VOLTAGE	330 mar	330 max	330 max	volts	
CREENING STREETS STREET VOLTAGE	1	ı	330 max	VOITS	
Com-No 9 Voltage			See curve page 70	Dage 70	
GRIP-No 1 (CONTROL-CRIP) VOLTAGE, Positive-					
bias value	0 max	0 max	0 max	volts	
PLATE DISSIPATION.	1.1 max	2 max	5 max	watts	
GRID-NO. 2 INPUT:					
For grid-No.2 voltages up to 165 volts	ı	ı	1.25 max	watts	
For grid-No.2 voltages between 165 and 530			ŧ		
volts.		ı	oe carve page 10	n. elimad	
FEAR HEATER-CATHODE VOLTAGE: Units reseting with respect to sethods	200 200	200	200 max	wolfs	
Heater positive with respect to cathode	200 max	200 max	200"max	volts	
				•	
Plate Supply Voltage	200	200	220	volta	
Grid-No.2 Supply Voltage	1	ı	150	vo]ta	
Grid-No.1 Voltage.	27	ı	ı	volta	
Cathode-Bias Resistor	ı	220	100	ohma	
Amplification Factor	99	41	1		
Plate Resistance (Approx).	12400	9400	68000	ohme	
Transconductance	5500	4400	11000	#mhos	
Plate Current,	۲-	9.2	24	ma	
Grid-No.2 Current	1	i	4 , 80.	ma	
Grid-No.1 Voltage (Approx.) for plate current					
of 100 µa.	ı	-6.5	0Ĭ-	volts	
Maximum Circuit Values:					
Grid-No.1-Current Resistance:	7 0	7.0	20 0	mdonom	
For cathode-bias operation	1 max	1 max		megohm	

SHARP-CUTOFF PENTODE

The dc component must not exceed 100 volts.

Miniature type used in compact radio equipment as an rf or if amplifier up to 400 megacycles per second. Outline 7B, OUTLINES SECTION

Tube requires miniature seven-con-

tact socket and may be mounted in any position. Except for slightly different

volts (ac/dc), 6.3; amperes, 0.3. For typical operation as a resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER SECTION. characteristics, this type is similar electrically to miniature type 6BC5. Heater

POWER PENTODE

Metal type used in output stage of video amplifier of television receivers. Outline 5, OUTLINES SECTION. Tube requires octal socket. Heater volts (ac/dc), 6.3; amperes, 0.65. Typi-

cal operation as class A, amplifier: plate volts, 300 max; grid No.3 connected to cathode at socket; grid-No.2 volts, 150 (300 max); grid-No.1 volts, -3 (0 max); peak af grid-No.1 volts, 3; plate ma., 30 (zero signal), 30.5 (maximum signal); grid-No.2 transconductance, 11000 µmhos; load resistance, 10000 ohms; maximum-signal ma., 7 (zero signal); 9 (maximum signal); plate resistance (approx.), 0.13 megohm; power output, 3 watts; plate dissipation, 9 max watts; grid-No.2 input, 1.5 max watts.

peres, 0.75. Characteristics as class A: amplifier: plate volts, 250; grid volts, -23; amplification used as vertical deflection amplifier in television receivers. Outline 14C, OUTLINES SECTION. Tube requires octal socket and may be mounted octal type having high perveance in any position. Heater volts (ac/dc), 6.3; amfactor, 8; plate resistance (approx.), 1780 ohms; Glass



volts, 500 max; peak positive-pulse plate volts, 2000 max; peak negative-pulse grid volts, 200 max; peak cathode ma., 180 max; average cathode ma., 60 max; plate dissipation, 7.5 max watts; peak heater-cathode volts, 200 max (the de component must not exceed 100 volts). This type is used principally for renewal purposes.

SHARP-CUTOFF PENTODE

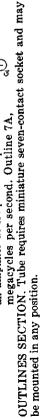
plifier: plate supply voits, 300 max; grid No.3 connected to cathode at socket; grid-No.2 sup-Minature type used as if amplifier in video stages of television receivers. Outline 7B, OUT-LINES SECTION. Tube requires miniature amperes, 0.45. Characteristics as class A: amseven-contact socket. Heater volts (ac/dc), 6.3; ply volts, 150 (300 max); cathode-bias resistor,



160 ohms; plate resistance (approx.), 0.5 megohm; transconductance, 9000, mthos; plate ma., 10; grid-No.2 ma., 2.5; plate dissipation, 3.2 max watts; peak heater-cathode volts, 90 max. This type is used principally for renewal purposes.

SHARP-CUTOFF PENTODE

wide-band applications. It is useful as an amplifier at frequencies up to 400 Miniature type used as an rf or if amplifier especially in high-frequency



volts

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0.3	,	0.02 max	٠ •	X0.
HEATER VOLTAGE (AC/DC)	HEATER CURRENT. DIRECT INTERELECTRODE CAPACITANCES (Approx.):	Grid No.1 to Plate.	Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield



volts volts

watt ma

0.6 max

See curve p 90 max

180 max See curve p 180 mor

PLATE VOLTAGE. GRDD-NO.2 (SCREEN-GRID) VOLTAGE GRID-NO.2 SUPERY VOLTAGE. GRID-NO.1 VOLTAGE, POSITIVE-BISS VAIUE.

Technical Data

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Center Values):

PLATE DISSIPATION
GRID-NO.2 INPUT:
For grid-No.2 voltages up to 90 volts
For grid-No.2 voltages between 90 and 180 volts

CATHODE CURRENT.
PRAY HEARS-CATHODE VOLTAGE!
HEARTER-CATHODE WITH THE SELVENT OF CATHODE
HEART REGALIVE WITH respect to cathode

0 max 1.7 max

megohm µmhos volts

120 120 130 180 5100 5100 7.7

Plate Supply Voltage Grid-No. Supply Voltage. Catholo-Bias Resistor. Plate Resistance (Approx.). Grid. No. 1 Voltage for plate current of 10 µa. Grid-No.2 Current.

Characteristics:

With external shield connected to pins 2 or 7.

volts volts ohms

LOW-MU TRIODE

HALF-WAVE VACUUM RECTIFIER Miniature type used as damper

LINES SECTION. Tube requires tube in horizontal-deflection circuits of television receivers. Outline 9C, OUT-

as tie points. It is especially important that this tube, like other power-handling be mounted in any position. Socket terminals 1, 2, 3, 6, 7, and 8 should not be used tubes, be adequately ventilated. Heater volts (ac/dc), 6.3; amperes, 1.55. miniature nine-contact socket and may

DAMPER SERVICE

For operation in 525-line, 30-frame system

:	volts	mg g	ma 	Watts	volts	
	7500max	550 max	220 max	arom c	5500 max	
Maximum Katings, (Lesign-Center Fulles).	PEAK INVERSE PLATE VOLTAGE (Absolute maximum)	PEAR PLATE CURRENT	DC PLATE CURRENT	PLATE DISSIPATION.	Peak Heater-Cathode Voltage	

Under no circumstances should this absolute value be exceeded.

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a \$25-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.



TWIN DIODE

Miniature, high-perveance type used as detector in FM and television circuits. It is especially useful as a ratio detector in ac-operated FM re-

6AL5 Related types: 3ALS, 12ALS

wave arrangement. Resonant frequency of each unit is approximately 700 megacycles per second. Outline 7A, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position. independently of the other, or the two sections can be combined in parallel or fullceivers. Each diode section can be used

	volts ampere	22222
	8.0 8.0	22.5 22.5 33.4 0.068 max
al-College Socked and and as a second and as a second and	FER VOLTAGE (AC/DC).	EXT INTERELECTRODE CAPACITANCES: Plate No.1 to Cathode No.1, Heater, and Internal Shield. Plate No.2 to Cathode No.2, Heater, and Internal Shield. Cathode No.1 to Plate No.1, Heater, and Internal Shield. Cathode No.1 to Plate No.2, Heater, and Internal Shield. Cathode No.2 to Plate No.2, Heater, and Internal Shield.

HALF.WAVE RECTIFIER

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Maximum Ratings, (Design-Center Values):	PEAK INVERSE PLATE VOLTAGE	PEA	۲

РЕАК Пратев-Сатнорр Voltage: Hauter negative with respect to cathode Heater positive with respect to cathode.

Typical Operations

AC Plate Voltage per Plate (rms)
Min. Total Effective Plate-Supply Impedance per Plate
DC Output Current per Plate.

300 300 9

250 1909 1909		_3	_	_ :	4		2		<u>-</u>	_	•		<u> </u>	- (V 5-4	_	°.
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ELECTRON-RAY TUBE

tuning in FM receivers. Maximum dimensions: over-all length, 3-1/16 inches; seated height, 2-1/3 inches; diameter, 1-9/32 inches, Tube requires octal socket and may be mounted in any Glass octal type used to indicate visually on a pair of rectangular fluorescent patterns the effects of changes in voltages applied to its grid useful in meeting the requirements for accurate and three deflecting electrodes. It is especially

position. Heater volts (ac/dc), 6.3; amperes, 0.15. Maximum ratings in indicator service: fluorescenttarget volts, 365 max, 220 min; peak heater-cathode volts, 90 max. Typical operation in indicator service: fluorescent-target volts, 315; deflecting electrodes Nos.1, 2, and 3 volts, 0; cathode resistor (approx.), 3300 ohms; deflection sensitivity (approx), 1 mm/volt; grid volts for fluorescence cutoff, -7. This type is used principally for renewal purposes.

SHARP-CUTOFF PENTODE BEAM POWER TUBE—

Related type: 12AL11

tor and audio-frequency output amplifier in television receivers. Outline quires duodecar twelve-contact socket Duodecar type used as FM detec-12B, OUTLINES SECTION. Tube re-

and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.9.

BEAM POWER UNIT AS CLASS A, AMPLIFIER

Maximum Ratings, (Design-Maximum Values): PLATE VOLTAGE Part No 2 (sersen-crem) VoltAGE

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(D)	PLATE VOLTAGE	GRID-NO.2 (SCREEN-GRID) VOLTAGE	PLATE DISSIPATION	GRID-No.2 INPUT	
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Tube requires ministure nine-contact socket and may be mounted in any position. Heater

8700 ohms; transconductance, 9800 µmhos; plate ma., 10; plate dissipation, 2 maz watts; peak heaterplification factor, 85; plate resistance (approx.) cathode volts, 80 max. This type is used principally for renewal purposes.

volts volts watts watts

275 max 275 max 10 max 2 max

			• •	•		,	0.7	. ,		
Plate Voltage. Grid-No.2 Voltage.	l) V. tage at	Maximum-Signal Plate Current. Zero-Signal Grid-No.2 Current. Maximum-Signal Grid-No.2 Current. Plate Registrance (Approx.)	Transconductance Load Resistance Total Harmonic Distortion Maximum-Signal Power Output.	Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-bias operation. For cathode-bias operation	 The dc component must not exceed 100 Yolfs. PENTODE UNIT AS CLASS A. AMPLIFIER 	Characteristics: Plate Supply Voltage. Grid-No.3 (Suppressor-Grid) Voltage. Grid-No.2 (Sereen-Grid) Supply Voltage. (Arhode-Bias Resisford)	Plate Resistance (Approx.). Transconductance, Grid No.1 to Plate. Transconductance, Grid No.3 to Plate.	Plate Current. Grid-No.2 Current. Grid-No.1 Voltage (Approx.) for plate current of 30 µa. Grid-No.3 Voltage (Approx.) for plate current of 50 µa.	PENTODE UNIT AS FM DETECTOR	Maximum Ratings, (Design-Maximum Values): PLATE VOLTAGE GRID-NO.8 VOLTAGE
volts	volts	កាន							5 5 6	, Q
max										

PENTODE UNIT AS FM DETECTOR

megohm µmhos µmhos

100 560 0.15 1000 400 1.3 2.1 2.1 4.5

Œ

volts volts volts ohms

megohm megohm

0.25 max 0.5 max

volts volts volts

- Dae

Typical Operation:

Plate Voltage.

330 max 330 max

330 max 54 max 9 max

............

volts volts

200 max 200 max

Heater negative with respect to cathode...... Heater positive with respect to cathode......

PEAR HEATER-CATHODE VOLTAGE:

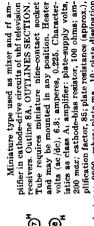
= Technical Data

megohm µmhos ohms

per cent

CARD-No.3 VoltaGE 28 max volts	Maximum Ratinas, $(Design-Maximum\ Value8)$:		
28 max 880 max See curve po 0 max 1.7 max 1.1 max See curve p 200 max 200 max		330 max	volts
830 max See curve pr 0 max 1.7 max 1.1 max See curve p	IE VOLTAGE.	28 max	volts
See curve po 0 max 1.7 max 1.1 max See curve p 200 max 200 max	JENOLO VOLTAGE.	830 max	volta
0 max 1.7 max 1.1 max See curve p 200 max 200 max	PLYOLE SUFFIEL TOLLINGS	See curve	page 70
1.7 max 1.1 max See curve p 200 max 200 max	PLNO.2 VOLLMOR VOLTAGE, Positive-bias value	0 max	volts
1.1 max See curve p 200 max 200 max	TE DISSIPATION.	1.7 max	watts
1.165 and 330 volts See curve paragraph 200 max 200 max eathode 200 max	D-No.2 InPut: Por wild-No.2 voltages up to 165 volts.	1.1 max	watts
200 max eathode	For grid-No.2 voltages between 165 and 330 volts	See curve	page 70
200 max	K HEATER-CATHODE VOLTAGE: Under noverive with respect to cathode	200 max	volts
	Heater positive with respect to cathode	200 max	volts

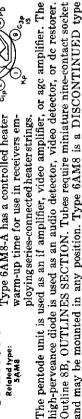
HIGH-MU TRIODE



DIODE—SHARP-CUTOFF PENTODE

6AM8A 6AM8

62P Miniature types used in diversified Type 6AM8-A has a controlled heater applications in television receivers.

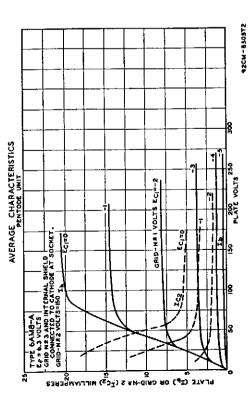


Outline 8B, OUTLINES SECTION. Tubes require miniature nine-contact socket and may be mounted in any position. Type 6AM8 is a DISCONTINUED type listed for reference only.	ne-conts NTINU	ict socket IED type
Heater Voltage (ac/dc). Heater Voltage: Heater Wereny Ting (average) for 64 M8-A. Direct Interelectrode Capacitances:	6.3 0.45 11	volts ampere seconds
District Options and Works	0	-

volts ampere seconds	<u>p</u> g	
6.3 0.45 11	1.8 8.8	0.015 max 6.5 2.6 0.006 max 0.15 max 0.1 max
Heater Voltage (ac/dc) Heater Voltage (ac/dc) Heater Verrent Heater Warn-Ither (Average) for 64 M8-A Direct Interellectrode Calagitances:	Pate to Cathode and Heater Cathode to Plate and Heater	Fortione Vol. to Plate Grid No.2, No.3 and Internal Shield Grid No.1 to Cathode, Heater, Grid No.2, No.3 and Internal Shield Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield Pentode Grid No.1 to Diode Plate e

PENTODE UNIT AS CLASS A, AMPLIFIER Maximum Ratings, (Design-Maximum Values):

The state of the s		
PLATE VOLTAGE	330 max	volts
Grid-No.3 (Suppressor-grid) Voltage, Positive value	0 max	volts
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max	volts
GRID-NO.2 VOLTAGE.	See curve page 70	page 70
GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	0 max	volta
PLATE DISSIPATION	3 2 max	watts
GRID-NO.2 INPUT:		
For grid-No.2 voltages up to 165 volts	0.55 max	watt
For grid-No.2 voltages between 165 and 330 volts	See curve page 70	page 70
РЕАК НЕАТЕК-САТНОРЕ VOLTAGE;		
Heater negative with respect to cathode	200 max	volts
Heater positive with respect to cathode	$200^{\circ} max$	volts
Characteristics:		
Plate Supply Voltage	125	volts
Grid No.3	to cathode a	t socket
Grid-No.2 Supply Voltage	125	volts



= Technical Data



rf amplifier in cathode-drive circuits of uhf television tuners covering the frequency range of 470 to 890 megacycles per second. Outline 7A, OUT-Miniature type used as mixer or

6AN4

LINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.225.

CLASS A1 AMPLIFIER

Maximum Ratings, (Design-Center Values): Plate Voltage Plate Dissipation Carteobe Cuerer Voltage: Pare Heater negative with respect to cathode Heater positive with respect to cathode	300 max 4 max 30 max 200 max 200 max	volts watts ma voits	
Characteristics: Plate-Supply Voltage Stathode-Bias Resistor Amplification Factor Transconductance Transconductance Grid Voltage (Approx.) for plate current of 20 µa	200 100 70 10000 13	volts ohms µmhos ma volts	
Maximum Circuit Values: Grid-Circuit Resistance: For fixed-liss operation. For eathode-liss operation. ■ The de component must not exceed 100 volts.	0.1 max 0.5 max	megohm megohm	

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

Miniature types used in a wide Scip variety of applications in color television receivers. The 6AN8-A has a con-63, KP trolled heater warm-up time for use in

receivers employing series-connected

6AN8A

6AN8

low-frequency oscillator, sync-separator, sync-clipper, and phase-splitter circuits. Outline 8B, OUTLINES SECTION. Tubes require miniature nine-contact socket and may be mounted in any position. Type 6AN8 is a DISCONTINUED type video amplifier, an age amplifier, or as a reactance tube. The triode unit is used in heater strings. The pentode unit is used as an intermediate-frequency amplifier, a listed for reference only.

HEATER VOLTAGE (AC/DC)	HEATER CUBRENT,	1
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8	货	HEATER WARE-UP TIME (Average) 6AN8-A
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volts ampere seconds 777

RCA Receiving Tube Manual =

222	22222
1.5 0.26	0.04 max 2.4 0.02 0.02 0.15
Direct Interellectrode Cafacitances: Triode Unit: Carl to Cathode and Heater 1.5	Finder Only to Plate. Grid No.1 to Plate. Grid No.2 Grid No.3, and Internal Shield. 7 Finde Grid to Peardoe, Heater, Grid No.2, Grid No.3, and Internal Shield. 7 Finde Grid to Peardoe Plate. Pentode Grid to Peardoe Plate. Pentode Grid No.1 to Triode Plate. Pentode Grid No.1 to Triode Plate. Pentode Flate to Triode Plate. Pentode Grid No.1 to Triode Plate. Pentode Flate to Triode Plate.

	be Unit O max volts O max volts See curve page 70 O max volts S max watts	See curve page 10 0 max volts	volts volts volts ohms umbos volts ma
	Peniode Unit 830 max 830 max 850 cur 0 max 2.3 max	200 max	Pentode Unit 125 125 56 56 170000 7800 7801 -6 -3 12
	Triode Unit 330 max - - 0 max 2.8 max	200 max 200°max	Triode Unit 150 -3 -3 21 4700 4500 -17
CLASS A, AMPLIFIER	Maximum Rafings, (Design-Maximum Values): PLATE VOLTAGE GRID-NO.2 SUPERT VOLTAGE GRID-NO.2 SUREEN-GRID) VOLTAGE GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-biss value. PLATE DISSIPATION FOR ERIGHANO.2 DISSIPATION FOR ERIGHANO.2 Voltages up to 165 volts.	For grid-No. Yorkages between 155 and 359 Volts PEAK HEATTE-CATHODE VOLTAGE 155 Heater negative with respect to cathode Heater positive with respect to cathode	Characteristics: Plate Supply Voltage Grid-No. 2 Supply Voltage Grid-No. 2 Supply Voltage Cathod-Bia Resistor. Plate Resistance (Approx.) Franconductance (Approx.) Grid-No. 1 Voltage (Approx.) for plate current of 20,as Grid-No. 1 Voltage (Approx.) for plate current of 16 ms and acthode-bias resistor of 0 ohms Plate Current. Grid-No. 2 Current.

Maximum Circuit Values: Grid-No.1-Circuit Resistance:* For fixed-bias operation.
--

^oThe de component must not exceed 100 volts.

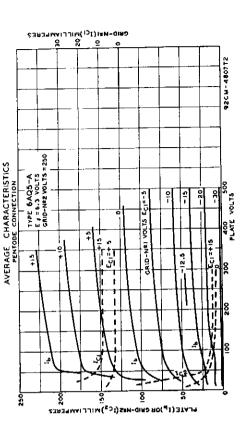
*If either unit is operating at maximum rated conditions, grid-No.1-circuit resistance for both units should not exceed the stated values.

6AQ5A Reialed hypes: 5AQ5, 12AQ5 **6AQ5**

BEAM POWER TUBE Miniatu amplifie and, tric flection ceivers

AMD A Mimature types used as output amplifiers primarily in automobile receivers and in ac-operated receivers and, triode-connected, as vertical deflection amplifiers in television receivers employing series-connected heater warm-up time for use in television receivers employing series-connected heater strings. Outline 7C, OUTLINES SECTION. Tubes require miniature seven-contact socket and may be mounted in any position. Within their maximum ratings, the performance of these types is equivalent to that of larger types 6V6 and 6V6-GTA. Type 6AQ5 is a DISCONTINUED type listed for reference only.	HEATER VOLTAGE (AC/DC) 6.3 volta
Aminature of AQ5A amplifiers preservers and sads, 12205 flection ampers. Type 6AQ5-A has a controll receivers employing series-connects TION. Tubes require miniature se position. Within their maximum ralent to that of larger types 6V6 and type listed for reference only.	Heater Voltage (ac/dd)

= Technical Data



CLASS A, AMPLIFIER

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-		PLATE VOLTAGE.	GRID-NO.2 (SCREEN-GRID) VOLTAGE	PLATE DISSIPATION	GRID-NO.2 INPUT	PEAK HEATER-CATHODE VOLTAGE:			BULB TEMPERATURE (At hottest point)
Maximum Ratings, (Design-Maximum Values):		-	•	μ,	•	,44			-

volts volts watts

275 max 275 max 12 max 2 max

volts volts

200 max 200 max 250 max

The de component must not exceed 100 volts.

Typical Operation:

megohm megohm

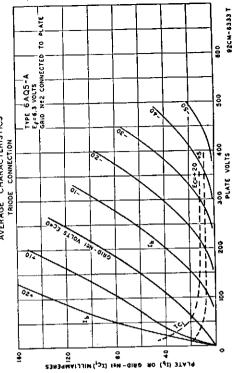
Same as for type 6V6-GTA within the limitations of the maximum ratings.

Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation Maximum Circuit Values

megohm megohm

0.1 max 0.5 max

AVERAGE CHARACTERISTICS



140

- Technical Data

VERTICAL DEFLECTION AMPLIFIER (Triode Connection)3

For operation in a 525-line, 30-frame system

Maximum Ratings, (Design-Maximum Values):

DC Prate Voltage	275 max	>
Park Posture Prins Plans Voltaget	1100 max	>
PEAK NEGATIVE-PUISE GRID-NO.1 (CONTROL-GRID) VOLTAGE	-275 max	>
PEAK CATHODE CURRENT.	115 max	
AVERAGE CATHODE CURRENT	40 max	
PLATE DISSIPATION.	10 max	3
PEAK HEATER-CATHODE VOLTAGE:	000	
Heater negative with respect to cathode	ZOO max	>
Heater positive with respect to cathode	200 max	>
Bur Temperature (At hottest point)	250 max	

volts ohms ohms umhos

22000 2300

200 9700 5000

Plate Registance (Approx.).....

Cathode Resistor.... Fransconductance...

ma ma atts

Plate Resistor...... Grid Voltage....R MS Oscillator Voltage.....

Plate Supply Voltage.....

fypical Operation, $(Each\ Unit)$:

Grid Resistor

volts

megohm

ohms

15000

9999

ohms

20000 max

Resistance between Cathode and Heater.....

Maximum Circuit Values, (Each Unit):

Grid-Circuit Resistance.

Input Resistance at frequency (Mc) = 100.

Plate Current.

Conversion Transconductance...

volts OC

...........

megohm

Maximum Circuit Value:

o Grid No.2 connected to plate.

2.2 max megohms Grid-No.1-Circuit Resistance: For cathode-bias operation..... + The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

The dc component must not exceed 100 volts.

TWIN DIODE—HIGH-MU TRIODE

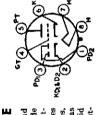
Miniature type used as combined detector, amplifier, and ave tube in compact radio receivers. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket. Heater volts (ac/dc), 6.3; amperes, 0.15. Characteristics of triode unit as class A₁ amplifier: plification factor, 70; plate resistance (approx.), plate volts, 250 (300 max); grid volts, -3; am-58000 ohms; transconductance, 1200 µmhos



plate ma., 1; peak heater-cathode volts, 90 max. This type is used principally for renewal purposes.

TWIN DIODE—HIGH-MU TRIODE

class As amplifier: plate volts, 250 mux; grid volts, -2; amplification factor, 70; plate resistaudio amplifier in circuits which require diode and triode units with separate cathodes. Outline 14C, OUTLINES SECTION. Tube requires octal socket. Heater volts (ac/dc), 6.3; amperes, Ratings and characteristics of triode unit as



1600 µmhos; plate ma., 2.3. This type is used principally for renewal purposes.

HIGH-MU TWIN TRIODE

Miniature type used as rf ampliand self-oscillating mixer in OUTLINESSECTION. Tuberequires FM/AM radio receivers. Outline 8B, nine-contact socket and may be oper-

ated in any position. Heater volts (ac/dc), 6.3; amperes, 0.435. With plate volts of 250 and grid volts of -2.3, class A₁ characteristics of each unit are: plate ma, 10; plate resistance (approx.), 9700 ohms; transconductance, 5900 µmhos; amplification factor, 57.

r whates, proces O new).	0		ne
MOXIMUM NOTHINGS, (L'estigne-Center Vinnes, Euch Cital);	PLATE VOLTAGE with plate ma = 0	PLATE VOLTAGE	CRID VOLTAGE Negative-bias value

... Bath at Markey Charles Trained Dook Ilain

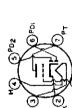
550 тах 300 тах	-100 max	4.5 maz	Tom GI	90 max
Plate Voltage with plate ma=0. Plate Voltage	GRID VOLTAGE, Negative-bias value. PLATE DISSIPATION:	For both plates with both units operating.	CATHODE CURRENT. PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode. Heater positive with respect to cathode.

watts watts

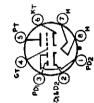
E

volts volts volts

volts volts



Glass octal type used as FM detector and ance (approx.), 44000 ohms; transconductance,



any position. Heater volts (ac/dc), 6.3; amperes, 0.8.

tact-socket and may be mounted in

CLASS A, AMPLIFIER Values for each unit

watt volts 330 max volts See curve page 70 See curve page 70 200 max max 3.1 max 330 max 65 max ¢ Heater negative with respect to cathode.......... GRID-No.1 (CONTROL-GRID) VOLTAGE, Positive-bias value..... GRID-No.3 (SUPPRESSOR-GRID) Voltage, Positive value GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE..... Maximum Ratings, (Design-Maximum Values): PEAK HEATER-CATHODE VOLTAGE: GRID-NO.2 VOLTAGE.... PLATE DISSIPATION... GRID-NO.2 INPUT: PLATE VOLTAGE.

Related type: fier tube in television receivers. Out-Duodecar type used as if-ampliline 12A, OUTLINES SECTION. Tube requires duodecar twelve-con-

megohm µmhos naa volts volta ohms volts Connected to cathode at socket volts ma $200^{\circ}max$ $0.2 \\ 10500$ 3.5 Grid-No.2 Supply Voltage Grid-No.1 Voltage (Approx.) for transconductance of 50 µmhos. Heater positive with respect to cathode...... Transconductance..... Plate Current,..... Plate Resistance (Approx.)..... Plate Supply Voltage...... The de component must not exceed 100 volts. Characteristics, $(Each\ Unit)$: Grid-No.2 Current..... Cathode-Bias Resistor... Grid No.3

٧.

Miniature type used as output tube primarily in automobile receivers and ac-operated receivers. Outline 7C, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position. Heater

POWER PENTODE

peak heater-cathode volts, 90 max. Within its maximum ratings, type 6AR5 is equivalent in performance

to glass-octal type 6K6-GT. Type 6AR5 is used principally for renewal purposes.

SEMIREMOTE-CUTOFF

TWIN PENTODE

ratings as class A. amplifier: plate and grid-No.2 (screen-grid) volts, 250 max; plate dissipation,

volts (ac/dc), 6.3; amperes,

8.5 max watts; grid-No.2 input, 2.5 max watts;

0.4. Maximum

BEAM POWER TUBE

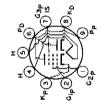
Miniature type used as output amplifier primarily in automobile and



6AS5	anniquer primary in accompanie and in ac-operated receivers. Outline 7C, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position. For curves of average plate characteristics, refer to type 35C5.		
HEATER CURRENT DIRECT INTERELECTRODE Grid No.1 to Plate Grid No.1 to Cathode Plate to Cathode, Hea	Herter Voltage (ac/dc). Heater Voltage (ac/dc). Diescy Interelectrode Cafacitances (Approx.): Grid No.1 to Pathode. Heater, Grid No.2, and Grid No.3. Plate to Cathode, Heater, Grid No.2, and Grid No.3.	6.3 0.8 12 0.6	volts ampere pf pf pf
!	CLASS A1 AMPLIFIER		
Maximum Ratings, (Design-Center Values): PLATE VOLTAGE GRID-No.2 (SCREEN-CRID) VOLTAGE LATE DISSIPATION GRID-NO.2 INPUT	Maximum Ratings, (Design-Center Values): PLATE VOLTAGE GRID-NO.2 (SCREEN-GRID) VOLTAGE PLATE DISSIPATION GRID-NO.2 INFUT	150 max 117 max 5.5 max 1.0 max	volts volts watts watt
Peak Hexter-Cathode Voltages: Heater negative with respect to cathode. Heater positive with respect to cathode. BULB TEMPERATURE (At hottest point)	Paak Heatene-Cathobe Vollade: Heaten regative with respect to cathode. Heaten positive with respect to cathode. Bulle Temperature (At hottest point).	100 max 100 max 250 max	volts volts
Typical Operation: Plate Voltage. Grid-No.2 Voltage. Grid-No.2 (Control-Grid		150 110 8.5	volts volts
Peak AF Grid-No.1 Voltz Zero-Signal Plate Curren Maximum-Signal Plate C Zero-Signal Grid-No.2 Ci Maximum-Signal Grid-No.2 Ci	Zero-Signal Plate Gurrent. Maximum-Signal Plate Current. Maximum-Signal Plate Current (Applox.) Maximum-Signal Plate Current (Applox.)	. 88 8. 75 88 84 75	
Transconductance Load Resistance Total Harmonic Distorti Maximum-Signal Power		5600 4500 10 2.2	ohms ohms per cent watts
Maximum Circuit Values	\$51		
Grid-No.1-Circuit Kesistance: For fixed-bias operation For cathode-bias operation	d-No.1-Circuit Kesistaneei For fixed-bias operation For eathode-bias operation	0.1 max 0.5 max	megohm megohm

SHARP-CUTOFF PENTODE DIODE-

ceivers. The pentode unit is used as an if amplifier, video amplifier, or agc Miniature type used in diversified applications in television and radio re-



used as an audio detector, video detector, or dc restorer. Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in amplifier. The high-perveance diode is any position.

volts ampere	þ	a a a a a a
6.3 0.45	3.0	0.03 max 7 2.4 0.005 max 0.15 max
Heater Voltage (ac/dc) Heater Current Direct Interelectrode Capacitanges:	Diode Unit: Plate to Cathode, Heater, Pentode Grid No.3, and Internal Shield	Pentode Unit: Grid No.1 to Plate Grid No.2, Grid No.3, and Internal Shield Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield Pentode Grid No.1 to Diode Plate Pentode Grid No.1 to Diode Cathode Pentode Plate to Diode Cathode

- Technical Data -

PENTODE UNIT AS CLASS A; AMPLIFIER

00 max volts 0 max volts 0 max volts See curve page 70 0 max volts 0 max volts 5 max watta 5 max watta	voits voits	volts at Bocket Volts ohras ohras umbos yolts ma	megohm megohm	volts ma ma ma volts
300 max 0 max 300 max See curve 0 max 2.5 max 0.5 max	200 maz 200°maz	200 led to cathode 150 300000 6200 -8 9.5	0,25 max 1.0 max	330 max 50 max 5 max 200 max 200°max
Maximum Ratings, (Design-Center Values): PLATE VOLTAGE GRID-NO.3 (SUPPLESOR-CRID) VOLTAGE, Positive value GRID-NO.2 SUPPLY VOLTAGE GRID-NO.2 (SCREEN-SRID) VOLTAGE GRID-NO.1 (SCREEN-SRID) VOLTAGE, Positive bias value PLATE DISSIPATION GRID-NO.2 INPUT: For grid-NO.2 INPUT: For grid-NO.2 Voltages up to 160 volts For grid-NO.2 Voltages between 150 and 300 volts	PRAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode.	Connected 100 volts Plate Supply Voltage. Grid No.3 and Internal Shield Grid No.2 Supply Voltage. Father Resistante. Grid No.2 Voltage. Grid-No.1 Voltage (Approx.) for plate current of 10 µm. Grid Mills No.2 Current. Grid-No.2 Current. 9 6 mm.	Maximum Circuit Values: Grid-No.1-Gircuit Resistance: For face-bias operation For cathode-bias operation For cathode-bias operation The dc component must not exceed 100 volts. DIODE UNIT	Maximum Ratings, (Design-Center Values): PERK PLYBES PLATE VOLTAGE PERK PLATE CURRENT DC PLATE CURRENT PERK HEATER-CAFFORD VOLTAGE FARK HEATER-CAFFORD VOLTAGE Heater negative with respect to cathode Reater positive with respect to cathode The dc component must not exceed 100 volts.



SHARP-CUTOFF PENTODE DUAL TRIODE-

Duodecar type used in television receivers. High-mu triode is used in audio if-amplifier service; mediummu triode is used in sync-separator

plifier service. Outline 12B, OUTLINES SECTION. Tube requires 12-contact socket and may be mounted in any position. Heater voltage (ac/dc), 6.3; amperes, 1.05. service; pentode is used in video am-

Triode Units CLASS As AMPLIFIER

	1 rouge	Trout O wind	200002	
Maximum Ratinas. (Design-Maximum Values):	No.1	No.1 No.2	Unit	
Dr. App. Voltaken	330 max	330 max 330 max	330 max	volts
CRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE	ı	1	330 max	volta
GRID-No.2 Voltage	ı	1	See curve page 70	page 70
GRID-NO.1 (CONTROL-CRID) VOLTAGE,	0 202	0 max 0 max	0 max	volts
CRID-NO.2 Input:			,	1
For grid-No.2 voltages up to 165 volts.	ì	ı	1.1 max	WALTE
For grid-No.2 voltages between 165 and 330 volts	ļ)		See curve page 10	page 10
PLATE DISSIPATION	1.5 max	z max	anu e	WHITE
PEAK HEATER-CATHODE VOLTAGE:	000	. 900	900 000	volts
Heater negative with respect to cathode	200°maz	200° max 200° max	200°maz	volts
Heater positive with respect to canada				
Characteristics			;	;
Plate Supply Voltage	200	200	200	Volta
Grid-No.2 Supply Voltage.	ļ¢	ı	021	volta
Grid Voltage	31	1 68	00	a mule
Cathode-Bias Registor	ţ	27	3 1	
Amplification Factor	19790	18	70000	am do
Plate Resistance (Approx.)	12400	3400	2000	

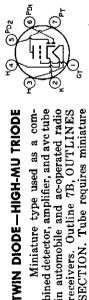
RCA Receiving Tube Manual

ma ma ma	volts volts	megohm megohm
10500 24 5.2	1 ∞	0.25 max 1 max 1
0 4400 7 9.2	-6.51	0.5 max 0.5 max 1 max 1 max
Transconductance 5500 Plate Current. 7 Grid-No.2 Current	Jrid-No.1 Vottage (Approx.). -5.5 For plate current of 100 μa.	Maximum Circuit Values, (Each Unit): Grid-No.1-Circuit Resistance: For fixed-bias operation. For extrode-bias operation. * The dc component must not exceed 100 volts.

Related type:

12AT6

bined detector, amplifier, and ave tube in automobile and ac-operated radio receivers. Outline 7B, OUTLINES SECTION. Tube requires miniature Miniature type used as a com-



seven-contact socket and may be mounted in any position. For typical operation as resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER

6.3 0.3 2.0 2.2 0.8 0.04	SECTION.		
į	Heater Voltage (ac/dc) Heater Current	6.3	lov smpe
	arelieotrode Capacitancies: rid to Triode Pilate	0.010	
	ate to Cathode and Heater	0.8 0.04 max	

	300 max	0.0 max	***************************************	90 max	ao mar
TRIODE UNIT AS CLASS A, AMPLIFIER Maximum Ratinas, (Destyn-Center Values):	PLATE VOLTAGE	PLATE DISSIPATION.	GRID VOLTAGE, FOSIUIVE-DIAS VAIUE	Heater negative with respect to cathode	Heater positive with respect to cathode

volts watt

volts

volts		o q	RECT.	
250	7 1 €	58000 1200	0.1	
100		54000 1300	œ. ©	
Characteristics: Plate Voltege	Grid Voltage A molification Factor	Plate Resistance. Transconductance	Plate Current	DIODE UNITS

Maximum Rating, (Design-Center Value):

PLATE CURRENT (Each Unit).

The two diode plates are placed around a cathode, the sleeve of which is common to the triode unit. Each diode plate has its own base pin. For diode operation curves, refer to type 5AV6.

1.0 max

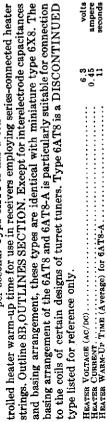
SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—



receivers utilizing an intermediate frequency in the order of 40 megacycles oscillator and mixer tubes in television per second. Type 6AT8-A has a con-Miniature types used as combined

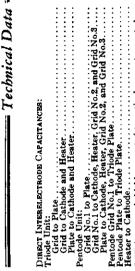
Related lype:

SATB



	မ က	0.40	⇉
r reletance only.	B (AC/DC)		UP TIME (Average) for GATS-A

volts



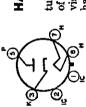
- 60 to

arrel er

1.6 0.04 max 0.008 max 6.01 0.03 max 4.8

0.06 max 4.6 0.9 0.05 max 0.05 max 6.0

With external shield connected to cathode except as noted.
With external shield connected to plate.



HALF-WAVE VACUUM RECTIFIER

vision receivers utilizing picture tubes having wide-angle deflection. Outline tubes in horizontal-deflection circuits of color television receivers and of tele-Glass octal types used as damper

6AU4GTA 6AU4G1

any position. These types may be supplied with pin No.1 omitted. Socket terminals 1, 2, 4, and 6 should not be used as tie points. It is especially important that these 14F, OUTLINES SECTION. Tubes require octal socket and may be mounted in tubes, like other power-handling tubes, be adequately ventilated. Type 6AU4-GT is a DISCONTINUED type listed for reference only.

3 5

2222

volts	ealadur#	ሽ	ā ē	
e .	1.0	ю. •	1.0	
HEATER VOLTAGE (AC/DC)	HEATER CURRENT	Plate to Heater and Cathode	Cathode to Heater and Plate	

DAMPER SERVICE

6AU4-GT For operation in a 525-line, 30-frame system

6AU4-GTA

	esign-Center	Design-Center Design-Maximum	um
Maximum Ratings:	Values	Values	
RE VOLTAGET	4500°max	4500 max	volts
PEAR PLATE CHRENT	1050 max	_	m
DC PLATE CURRENT	175 max		E C
PLATE DISSIPATION	6 max	6.5 max	watts
Peak Heater-Cathode Voltage:			=
Heater negative with respect to cathode	4500° - mag	4500* max	Noite
Heater positive with respect to cathode			POICA
Except as noted.	•	•	,

Except as noted.

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 755-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

Absolute Maximum. Under no circumstances should this absolute value be exceeded.

The de component must not exceed 900 volts.

The de component must not exceed 100 volts.



Glass octal type used as horizontal deflection amplifier in low-cost, highefficiency deflection circuits of television receivers employing either transformer coupling or direct coupling to

the deflecting yoke. Outline 14C, OUTLINES SECTION. Tube requires octal socket and may be mounted in any position.

		•
HEATER VOLTAGE (AC/DC)	9	Volta
	16	ampere
HEATER CURRENT		
DIRECT INTERELECTRODE CAPACITANCES (Approx.):	•	•
Grid No.1 to Plate	9	۵.
Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3.	11.3	ā.`
Plate to Cathode. Heater Grid No.2, and Grid No.3.	-	Δ,
TRANSCONDUCTANCE#	2600	i i i i i i i i i i i i i i i i i i i
Mu-Factor. Grid No.2 to Grid No.1t	6. 6.	
# For plate volts, 115; grid-No.2 volts, 175; grid-No.1 volts, -20.		
† For plate volts, 100; grid-No.2 volts, 100; grid-No.1 volts, -4.5.		
		160

For operation in a 525-line. 30-frame sustem HORIZONTAL DEFLECTION AMPLIFIER

to to the series of the series		
Maximum Ratinas, (Design-Center Values):		
DC PLATE VOLTAGE	550 max	volt
PRAK POSITIVE-PULSE PLATE VOLTAGE* (Absolute Maximum)	5500°max	volt
PRAK NEGATIVE-PULSE PLATE VOLTAGE	-1250 max	volt
DC GRID-No.2 (SCREEN-CRID) VOLTAGE*	200 max	volt
PEAK NEGATIVE-PULSE GRID-NO.1 (CONTROL-GRID) VOLTAGE	-300 max	volt
PEAK CATHODE CURRENT.	400 max	Ē
AVERAGE CATHODE CURRENT	110 max	ä
GRID-No.2 INPUT	2.5 max	Watt
PLATE DISSIPATION ##	10 max	watt
PEAR HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max	AOID
Heater positive with respect to cathode	200max	Volt
BULB TEMPERATURE (At hottest point)	210 maz	ř

550

Grid-No.1-Circuit Resistance..... Maximum Circuit Value:

* The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.
• Under no circumstances should this absolute value be exceeded.

* Obtained through a series dropping resistor of sufficient magnitude to limit the grid-No.2 input to the rated maximum value.

ifAn adequate bias resistor or other means is required to protect the tube in the absence of excitation. ■The de component must not exceed 100 volts.

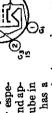
6AU6

3AU6, 4AU6, 12AU6

Related types:

SHARP-CUTOFF PENTODE **6AU6A**

Miniature types used in compact radio equipment as rf amplifier espeplications; also used as limiter tube in FM equipment. Type 6AU6-A has a cially in high-frequency, wide-band ap-



ation as resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMrefer to ELECTRON TUBE APPLICATIONS SECTION. For typical opercontrolled heater warm-up time for use in applications employing series-connected heater strings. Outline 7B, OUTLINES SECTION. Tubes require miniature sevencontact socket and may be operated in any position. For a discussion of limiters, PLIFIER SECTION. Type 6AU6 is a DISCONTINUED type listed for reference only.

HEATER VOLTAGE (AC/DC). HEATER CURRENT HEATER WARM-UP TIME (Average) for \$AU6-A.	: : :	6.3 0.3 11	volts ampere seconds	
DIRECT INTERELECTRODE CAPACITANCES: Without External External	hout	With External		
Penkode Connection: Grid No.1 to Plate	ene 15 max	0.0035 max 0.0035 max	ъľ	
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield.	ıά	6.6	jď	
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	0	5.0	ď	
	ų	40	ž	
Internal Shield 2.0 Grid No.1 to Cathode and Heater 3.2	୍ଷ୍	9 69	z.	
Plate, Grid No.2, Grid No.3, and Internal Shield to Cathode and Heater	81	œ.	þ	
 With external shield connected to cathode. Grid No.2, grid No.3, and internal shield connected to plate. 				

GRID-NO.2 INPUT: For grid-No.2 voltages up to 165 volts For grid-No.2 voltages between 165 and 330 volts	į l	0.75 max wat See curve page 7	wat 'e page 7
GRID-NO.I (CONTROL-GRID) VOLTAGE: Positive-bias value.	0 max	0 max	Vol
Peak Hearles-Cartlons Vol.740E: Heater negative with respect to cathode. Heater positive with respect to cathode	200 max 200*max	200 max 200⁴max	volt
Characteristics: Connection	Pentode Connection	nection	<u>-</u>
	Connected to cathode at socket	athode at so	cket
	100 125	150	Vo.
Cathode-Bias Kesistor		e t	Out
4800	9.5 1.5 3900 4500	1.0 5200	megohπ μmbo
10.0	24.2 2.5 2.5 2.5		No.
Grid-No. 2 Current			8

#2

= Technical Data

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† Grid No.2, grid No.3, and internal shield connected to plate. ^ The dc component must not exceed 100 volts.

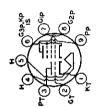
	_
AVERAGE CHARACTERISTICS	

					-						89
						_					-3.0
				<u> </u>		2		-1.5	-2.0		300 400
	SOCKET	0 <u>=</u> 123		\$		CRID-NEI VOLTS ECI=-1.0					300
	THODE AT SO					Q 25	EC I = 0				200
TYPE 6AUS EF = 6.3 VOLTS	CONNECTED TO CATHODE AT CONNECTED TO CATHODE AT CONNECTED TO CATHODE AT CALLOR								4		- 81
	20 6 20 6 20 6 20 6 20 6 20 6 20 6 20 6		/	<u> </u>	<u>t</u>	L	X		7	t	IJ.

MEDIUM-MU TWIN TRIODE

Miniature type used as phase inverter or amplifier in television receivers employing series-connected heater strings. Outline 3B, OUT-LINES SECTION. Heater volts (ac/de), 6.3 (series), 3.15 (parallel); amprese, 3.3 (series), 9.6 (parallel); warm-up time (average) in parallel arrangement, 11 seconds. Except for heater and heater-cabode ratings, this type isidentical with miniature type 12AU, The 6AU; a DISCONTINUED typelisted for reference only.





SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-

Miniature types used in television receiver applications. Tubes have con-

6AU8A Related type: trolled heater warm-up time for use in series-heater strings. Pentode unit is used as video amplifier, if amplifier,

age amplifier. Triode unit is used in sync-amplifier, sync-separator, sync-clipper, and phase-inverter circuits. Outline 8D, OUTLINES SECTION. Tubes require nine-contact socket and may be mounted in any position. Type 6AU8 is a DIS-CONTINUED type listed for reference only.

0 max volts
See curve page 70
330 max volts
8,5 max watts

3.5 maz

volts

Pentode Connection 330 max

Triodet Connection 275 max

CLASS AL AMPLIFIER

PLATE VOLTAGE.....GRID-NO.3 (SUPPRESSOR-GRID) VOLTAGE, POSITIVE VALUE..... GRID-No.2 (SCREEN-GRID) VOLTAGE.....GRID-No.2 SUPPLY VOLTAGE..... PLATE DISSIPATION....

Maximum Ratings, (Design-Maximum Values):

RCA Receiving Tube Manual

ma ma watta watta

400 max 110 max 2.5 max 11 max

= Technical Data ==

volta Colta

200 max 200 max 210 max

A VERAGE CATHODE CURRENT
GRID-NOZ INPUT
PLATE DUSHIVATIONIT
PRAY HEATER-CATHODE VOLTAGE:
HEATER-CATHODE VOLTAGE:
HEATER positive with respect to cathode
Heater positive with respect to cathode
Heater positive with respect to cathode.

PEAK CATHODE CURRENT.

0.47 max

Grid-No.1 Circuit Resistance.....

Maximum Circuit Value:

volts ampere seconds	i i i	55555
6.3 0.6 11	2.2 2.6 0.34	0.06 7.5 8.4 0.022 max 0.006 max 0.12 max
Heater Voltage (AC/DC) Heater Unbery Heater Warm-IT Time (A verre) Direct Interelectrode Capacitances:	Trioge Unit. Grid to Plate. Grid to Cathode and Heater.	Fenrode No.1 to Plate Grid No.1 to Plate Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield. Triode Grid to Penrode Plate. Pentode Grid No.1 to Triode Plate. Pentode Grid No.1 to Triode Plate.

Triode Unit Pentode Unit	330 max 3	_ 0 max	2.8 max 3.3 max watts	1 max watt See curve page 70	200 max 200 max volts 200 max volts
Maximum Ralings, (Design-Maximum Values):	PLATE VOLTAGE GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE.	GRID-NO.2 VOLTAGE. GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	PLATE DISSIPATION. CRID-NO.2 INPUT	For grid-No.2 voltages up to 165 volts. For grid-No.2 voltages between 165 and 330 volts.	Peak Hearer-Cathode Voltage: Heater negative with respect to cathode

Characteristics:	Triode Unit	Triode Unit Pentode Unit	
Plate Supply Voltage	150	200	volts
Grid-No.2 Supply Voltage	1	125	volts
Cathode-Bias Resistor	150	82	ohms
Amplification Factor	43	1	,
Plate Resistance (Approx.).	8100	100000	ohms
Transconductance.	9300	2008	Soutan
Crid-No.1 Voltage (Approx.) for plate current of 100 µa	6.0	0.1	VOITS
Plate Current	5	1.5	mg
Grid-No.2 Current	ı	т 4.	ma
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance: For fixed-bias operation.	0.5 max	0.25 max	megohm
For cathode-bias operation	1.0 max		megohm
■ The de component must not exceed 100 volts.			

6AV5GA

BEAM POWER TUBE

6AV5GT Related lypes:

vision receivers employing either transformer coupling or direct couzontal deflection amplifiers in tele-I2AV5GA, 25AV5GA



Characteristics:

pling to the deflecting yoke, 6AV5-GA contine 19B, 6AV5-GT Outline 14C, OUTLINES SECTION. Tubes require octal socket and may be mounted in any position. Type 6AV5-GT is a DISCONTINUED type listed for reference only.

volts amperes amhos
6.3 1.2 5900 4.3
Heater Voltage (ac/dc) Haater Voltarent Transcondigance* Mu Factor, Grid No.2 to Grid No.1**

* Plate volts, 250; grid-No.2 volts, 150; grid-No.1 volts, -22.5.

For operation in a 525-line, 30-frame system HORIZONTAL DEFLECTION AMPLIFIER

Values);	
(Design-Center	
Ratings	
Maximum	

DC PLATE VOLTAGE.	PEAK POSITIVE-PULSE PLATE VOLTAGET (Absolute Maximum)	PEAR NEGATIVE-PULSE PLATE VOLTAGE	DC GRID-No.2 (SCREEN-GRID) VOLTAGE	PEAK NEGATIVE-PULSE GRID-No.1 (CONTROL-GRID) VOLTAGE
DC PLATE VOLTAGE	PEAK POSITIVE-PULSE PLATE V	PEAK NEGATIVE-PULSE PLATE	DC GRID-No.2 (SCREEN-GRID)	PEAK NEGATIVE-PULSE GRID-N

volts volts volts volts

550 max 5500°max -1250 max 175 max -300 max

Glass octal types used as hori-

Ç								
3IST.				<u> </u>			~ **	*/-
CTE								\sum
ARA TAR	%6 %CTS				١٥,		//	$\langle \ \rangle$
AVERAGE PLATE CHARACTERISTICS TRIODE UNIT	TYPE 6AV6 E = 6.3VOLTS			,	2,53	1		7
5"	£ 3						\rightarrow	Α.
9			15					Ι,
ERAC		67	//					1
₹	_ •	9:-						$^{\prime}$
	وويو							\triangle
		S TON S	7/65					Λ.
								abla
i)	\angle
Į	ļ <u>.</u>		Ļ					_
			\$31	YMPER	ב אורר	TAJ4		
						,		

V6, 4AV6, 12AV6 Related types:

	_		34		
Miniature type used as combined	detector, amplifier, and ave tube in	automobile and ac-operated radio re-	ceivers. The 6AV6 may be substituted	orth directly for the 6AT6 in applications	nplification of the 6AV6 is advantageous.
				્ટુ	where the higher an

TWIN DIODE—HIGH-MU TRIODE

+ The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 52c-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

* Under no circumstances should this absolute value be exceeded.

If An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

The dc component must not exceed 100 volts.

	vol ampe	•						
	8.8 8.8	With External	Shield	2.0	2,2	1.2	0.04 max	
,		Without External	Shield	2.0	27.	8.0	0.04 max	
							idid	
•	Heater Vollage (ac/dc). Heater Curbent		DIRECT INTERELECTRODE CAPACITANCES:	Triode Grid to Triode Plate	Triode Grid to Cathode and Heater	Triode Plate to Cathode and Heater	Flate of Diode Unit No.2 to Triode Grid	
	HEATER VOLTA HEATER CURRE		DIRECT INTERS	Triode Gri	Triode Gri	Triode Pla	Flate of Di With external	

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	ζ
	2
4	?
1	Ž
700	

	volts	Watt	volts volts
	330 max 0 max	0.0	200 max 200^max
Maximum Rating, (Design-Maximum Value):	Plate Voltage. Grid Voltage, Positive-bias value.	PLATE DISSIPATION POLTAGE:	Heater negative with respect to cathode. Heater positive with respect to cathode.

_	-	
Plate Voltage	Amplification Factor.	AVERAGE PLATE CHARACTERISTICS

volts volts

200

878

	_								-	92CM-6679T
										200
TINO	9/1	/OLTS			-	o'	-2	()	<u> </u>	PLATE VOLTS
TRIODE	TYPE 6AV6	€.¢=6.3\		her.		1/23			4	300 PLATE V
		_ \$	70	$\top /$					7	200
	-	23	L VOLTS	/s					7	9 <u>0</u>
	_			,					7	

ohms umpos

8

TH B

1.0 max

DIODE UNITS Maximum Rating, (Design-Maximum Value):

TYPE 6AW8-A

AVERAGE CHARACTERISTICS

TRIODE UNIT

= Technical Data

Ep . 6.3 YOLTS

3 SETION OINS

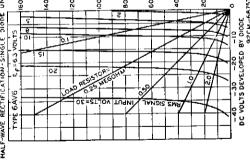
The two diode plates are placed around a cathode, the sleeve of which is common to the triode unit. Each diode plate has its own base pin. Diode biasing of the triode unit is not recommended.

INSTALLATION AND APPLICATION

Type 6AV6 requires miniature sevencontact socket and may be mounted in any position.Outline7B,OUTLINESSECTION

mended for use only in resistance-coupled circuits. Refer to the RESISTANCE-COU-PLED AMPLIFIER SECTION for typical The triode unit of the 6AV6 is recomoperating conditions.

supply, or from a cathode-bias resistor. It Grid bias for the triode unit of the 6AV6 may be obtained from a fixed source, method because of the probability of platecurrent cutoff, even with relatively small sigsuch as a fixed-voltage tap on the dc power should not be obtained by the diode-biasing nal voltages applied to the diode circuit.



PT() Miniature types used in a wide variety of applications in television receivers. These types have a controlled heater warm-up time for use in SHARP-CUTOFF PENTODE HIGH-MU TRIODE-

6AW8A Related hype:

BAWBA

6AW8

heater strings. The pentode unit is used as an if amplifier, video amplifier, age sync-separator, sync-clipper, and phase-splitter circuits. Outline 8D, OUTLINES amplifier, or reactance tube. The triode unit is used in low-frequency oscillator, SECTION. Tubes require miniature nine-contact socket and may be mounted in receivers employing series-connected

any position. Type 6AW8 is a discontinued type listed for reference only.

External Shield With 3.0 6.3 11 3.4 Heater Voltage (ac/dc)..... Heater Current. Heater Warm-Up Time (average). Without External Shield 2.2 3,2 .. Grid to Plate
Grid to Cathode, Pentode Cathode, Pentode Grid No.3,
Internal Shield, and Heater
Plate to Cathode, Pentode Cathode, Pentode Grid No.3,
Internal Shield, and Heater DIRECT INTERELECTRODE CAPACITANCES:

volts ampere reconds

펂 pi. ħ jd Ħ おおば

4.5 0.005 max 0.025 max

3.6 0.008 max 0.15 max

ternal Shield
Pentode Grid No.1 to Triode Plate
Pentode Blate to Triode Plate

With external shield connected to pins 4 and 5.

0.05 max

0.06 max

Grid No.1 to Plate. Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Plate to Cathode, Heater, Grid No.2, Grid No.3, and In-

Pentode Unit

9

10

8 8 Мхсяолы 8 GECTIFIED AVERAGE DIODE CHARACTERISTICS HALF-WAVE RECTIFICATION - SINGLE DIONE UNIT 991 ន្ត 92CM-6875T

95 ್ಕ್

Triode Unit PLATE DISSIPATION GRID-NO.2 INVICATION FOR grid-No.2 voltages up to 165 volts For grid-No.2 voltages between 165 and 330 volts For grid-No.2 voltages between 165 and 330 volts Far grid-No.2 voltages between 165 and 330 volts Far grid-No.2 voltages between 165 and 330 volts Farker negative with respect to cathode Heater positive with respect to cathode Plate Supply Voltage Grid-No.2 Supply Voltage Grid-No.2 Supply Voltage Grid-No.2 Supply Moltage Grid-No.2 Supply Moltage Ambilingation Factor Transconductance. Grid-No.1 Voltage (Approx.) for plate current of 20 µa.... Amolification Factor Plate Resistance (Approx.). Characteristics:

volts watts

0 max 3, 75 max

0 max 1.1 max

0 max volta See curve page 70

330 max

Triode Unit

CLASS A, AMPLIFIER

PLATE VOLTS

-1

330 mar

1 1

PLATE VOLTAGE.
GRID-NO. (SCREEN-GRID) SUPPLY VOLTAGE.
GRID-NO.2 VOLTAGE.
GRID-NO.1 (CONTROL-GRID) VOLTAGE:
Positive bias value.

Maximum Ratings, (Design-Maximum Values):

92CM - 8644T Pentode Unit 1.1 max watta See curve page 70

1.0

volts volts

200 max 200°max

200 max 200°max

Pentode Unit

150 150

200 । क्ष 18

volts volts volts ohms

megohm µmhos volts

4000

EC-63 VOLTS 350 AVERAGE CHARACTERISTICS PENTODE UNIT GRID-NEI VOUTS ECI "O 1 ŝ i S 40 (S2) ŝ 2

92CM-91737

RCA Receiving Tube Manual

megohm megohm 0.25 max 1.6 max 0.5 max 1.0 max For fixed-bias operation..... For cathode-bias operation.... Grid-No.2 Current..... "The dc component must not exceed 100 volts. Grid-No.1-Circuit Resistance: Maximum Circuit Values: Plate Current.

HALF-WAVE VACUUM RECTIFIER

12AX3, 17AX3 Related types:

tube in horizontal-deflection circuits of television receivers. Outline 12C, OUTLINES SECTION. Tube requires 12-contact socket and may be Duodecar type used as damper

<u>پر</u>



DAMPER SERVICE

For operation in a 525-line, 30-frame system

	volts	ma	Ш	watts	volts volts
	5000 max	1000 max	165 max	5.3 max	5000 max 300 max
Maximum Ratings, (Design-Maximum Values):	PEAK INVERSE PLATE VOLTAGE®	PEAK PLATE CURRENT	DC PLATE CURRENT,	PLATE DISSIPATION	PRAK HEATER-САТНООБ VOLTAGE: Heater negative with respect to cathode Heater positive with respect to cathode.

Characteristics, Instantaneous Value:

volts Tube Voltage Drop for plate current of 250 ma

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.
The dc component must not exceed 900 volts.
The dc component must not exceed 100 volts.

6AX4GT HALF-WAVE VACUUM RECTIFIER

Glass octal types used as damper tube in horizontal deflection circuits of Related types: television receivers. Outline 14C, OU 1-12AX46T, 12AX46TB, LINES SECTION. May be supplied 17AX46T, 17AX46TA, with pin No. 1 omitted. Tubes require 23AX46T television receivers. Outline 14C, OUT-6AX4GTB



4, and 6 should not be used as tie points. It is especially important that these tubes, like octal socket and may be operated in any position. Socket terminals 1, 2, other power-handling tubes, be adequately ventilated

ov anope	
6.5 1.5 1.5	ес 1816-4
Heater Voltage (ag/dd). Heater Current	DIRECT INTERELECTRODE CAPACITANCES (Approx.): Cathode to Plate and Heater Plate to Cathode and Heater Heater to Cathode.

olta

d d d

DAMPER SERVICE

r or operation in a 020-time, 50-frame system	waren's		
Maximum Ratings, (Design-Maximum Values):	SAX4-GT	6AX4-GTB	
PEAK INVERSE PLATE VOLTAGE	4400 max	4400 max 5000 max	volts
PEAK PLATE CURRENT.	825 max	1000 max	E LL
DC PLATE CURRENT	137 max	165 max	шB
PLATE DISSIPATION.	5 max	5.3 max	watts
PEAK HEATER-CATHODE VOLTAGE:		,	;
Heater negative with respect to cathode	4400 max	5000 max	voite
Heater nositive with respect to cathode	300 002	$300^{\circ}max$	volts

= Technical Data =

Characteristics, Instantaneous Test Condition

8 8

Tube Voltage Drop for plate current of 250 ma.

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

The de component must not exceed 900 volts. The de component must not exceed 100 volts.

FULL-WAVE VACUUM RECTIFIER

supply of radio equipment having moderate de requirements. Outline 14C, OUTLINES SECTION. This type Glass octal type used in power

6AX5GT

may be supplied with pin No.1 omitted.

Tube requires octal socket and may be mounted in any position. It is especially important that this tube, like other power-handling tubes, be adequately ventilated. Heater volts (ac), 6.3; amperes, 1.2.

FULL-WAVE RECTIFIER

Maximum Ratings, (Design-Center Values):		
PEAK INVERBE PLATE VOLTAGE. LOM STRANGE CURRENT (PE PLATE) LOM SURGER TO THE STRANGE CONTROL OF THE STRANGE CONT	1250 max 375 max	volta
FOR CHITCHEN TARANISES CLARK CORRENT FOR CHITCHION OF U.2 SECOND MAXIMUM AC PLATE SUPPLY VOLTAGE (Per Plate, rms) DOI UTPUT CHIRBERT (Per Plate, rms) DOIL THOUSE CHIRBERT (Per Plate, rms)	2.6 mar See Rati See Rati	6 max amperes See Rating Chart See Rating Chart
TEAR IMPARATE AND VOLVENE HEAD THE REPORT TO CALIDORE HEATER DESIGNE WITH respect to cathode.	450 max 450 max	volts volts
Typical Operation with Capacitor Input to Fitter:		
L 1	006	volts
Filter Input Capacitor* Effective Plate-Supply Impedance Per Plate. 50	10 105	Ja, ohme
DC Output Voltage at Input to Filter (Approx.):	1	volts
At most current of 198	540	volta
80 ma	490	voits
Voltage Regulation (Approx.): Half-load to full-load current	90	volts
Typical Operation with Choke Input to Fifter:		
Voltage (rms)		volts
Filter Input Choke, 10# DC Output Voltage at Input to Filter (Approx.):	##01	henries
270		volts
	365	voits
At full-load current of 150 ma	350	volts volts



		MAXIMUM OPERATING VALUES WITH: CHOKE-IMPUT FILTER CAPACITOR-INPUT FILTER					
ŀ		IMUM OPERATING VALUES ! HOKE-INPUT FILTER -CAPACITOR-INPUT FILTER	و				ŝ
ŀ		CHOKE-INPUT FILTER				350 6 450	400
ŀ		OPE!	67				300
	s S	CHOKE	/_				200
	TYPE 6AX5-GT	*					100
ł	TYPE Ef = 6.3		15 A 162.5			98	2
١	31A.			_	Tuato	00 00	0

AC PLATE SUPPLY VOLTS (RMS) PER PLATE (WITHOUT LOAD)
9255-73831

= RCA Receiving Tube Manual

Half-load to full-load current. Voltage Regulation (Approx.):

* Higher values of capacitance than indicated may be used but the effective plate-supply impedance may have to be increased to prevent exceeding the maximum rating for hot-switching transient plate

15

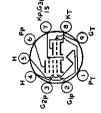
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This value is adequate to maintain optimum regulation provided the load current is not less than 30 ma. For load currents less than 30 ma, a larger value of inductance is required for optimum regulation.

This value is adequate to maintain optimum regulation provided the load current is not less than 35 ma. For load currents less than 35 ma, a larger value of inductance is required for optimum regulation.

SEMIREMOTE-CUTOFF PENTODE MEDIUM-MU TRIODE—

unit is used as a sync separator. Outline 8B, OUTLINES SECTION.Tube Miniature type used in televisionreceiver applications; the pentode unit is used as a video amplifier; the triode

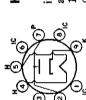


requires miniature nine-contact socket and may be mounted in any position.

HEATER VOLTAGE (AC/DC)	6.3	volts
HEATER CURRENT.	0.45	ampere
DIRECT INTERELECTRODE CAPACITANCES:		
Triode Unit:		
Grid to Plate	1.8	ď
Grid to Cathode and Heater	64 10	ď
Plate to Cathode and Heater	-	. '
Pentode Unit:		
Grid No.1 to Plate	0,006 max	ď
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and		
Internal Shield	rœ	Ja
Plate to Cathode, Heater, Grid No.2, Grid No.3 and Internal Shield .	еэ 73	jū
Hooper to Cathoda (Rach unit)		

Heater to Cathode (Each unit)	3.5	ď
CLASS A. AMPLIFIER		

CLASS A, AMPLIFIER			
Maximum Ratings, (Design-Center Values):	Triode Unit Pentode Unit	Pentode Un	725
PLATE VOLTAGE GRID-NO.2 SUPPLY VOLTAGE	300 max _	300 max 300 max	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	1	See curve page 70	page 70
GRID-No.1 (CONTROL-GRID) VOLTAGE,	0 max	0 max	volts
PLATE DISSIPATION	2.7 max	2.8 max	watts
GRID-No.2 Input			
For grid-No.2 voltages up to 150 volts	,	0.5 max	watt
For grid-No.2 voltages between 150 and 300 volts.	ı	See curve page 70	page 70
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	90 max	90 max	volts
Heater positive with respect to cathode	30 max	90 max	volts
:			
Characteristics:			
Plate Supply Voltage	150	250	volts
Grid-No.2 Supply Voltage	ı	110	volts
Cathode-Bias Resistor	99	120	ohma
Amplification Factor	40	1	
Plate Resistance (Approx.).	0.005	0.4	megohm
Transconductance	8500	4800	gottan
Grid-No.1 Voltage (Approx.) for plate current of 10µa	-12	-12	volts
Plate Current	18	10	EUI
Grid-No.2 Current.	ı	3.5	ш



HALF-WAVE VACUUM RECTIFIER

= Technical Data

Novar type used as damper tube in horizontal deflection circuits of blackand-white television receivers. Outline 17B, OUTLINES SECTION. Tuberequires novar socket and may be oper-

Related types:

12AY3, 17AY3

It is especially important that this tube, like other power-handling tubes, be ated in any position. Socket terminals 1, 3, 6, and 8 should not be used as tie points. adequately ventilated.

volts amperes	ja ja
6.3	8.00 8.00
HEATER VOLTAGE (AC/DC) HEATER CURRENT	Direct Interpretations (Aracitances (Approx.): Plate to Cathode and Heater. Cathode to Plate and Heater. Heater to Cathode

For operation in a 525-line, 30-frame system DAMPER SERVICE

Values):	
(Design-Maximum	
Ratings,	
Maximum	

vo ta	ma	mg	Watts		Volts	-
5000 max	1100 max	175 max	6.5 max		5000 mar	000
Peak Inverse Plate Voltage	Peak Plate Current	DC PLATE CURRENT.	PLATE DISSIPATION	Peak Heater-Cathode Voltage:	Heater negative with respect to cathode	

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a \$55-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

The de component must not exceed 900 volts.

The de component must not exceed 100 volts. Heater positive with respect to cathode...

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

Miniature type used in a wide variety of applications in television receivers. The pentode unit is used as an if amplifier, video amplifier, age

ode unit is used in low-frequency oscillator, sync-separator, sync-clipper, and phase-splitter circuit. Outline 8B, OUTLINES SECTION. Tube requires miniature amplifier, or reactance tube. The trinine-contact socket and may be mounted in any position.

HEATER VOLTAGE (AC/DC)	6.3	volts
HEATER CURRENT.	0.45	ambere
1 JIRKI IN EMBLECINOUS CALACITATORS.		
Triode Unit:		•
Gnd to Plate	- (ď,
Grid to Cathode, Heater, Pentode Grid No.3, and Internal Shield	N :	ď
Plate to Cathode, Heater, Pentode Grid No.3, and Internal Shield	1.7	þ
Pentode Unit:		
Grid No.1 to Plate.	0.02 max	ρť
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	9.0	jd
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	2.2	ď
Triode Grid to Pentode Plate	0.027 max	ď
Pentode Grid No.1 to Triode Plate	0.020 max	ā
Pentode Plate to Triode Plate	0.045 max	ā
CLASS A, AMPLIFIER		

volts volts

200 max 200∎max

GRID-NO.2 Inpur:
For grid-No.2 voltages up to 150 volts.
For grid-No.2 voltages between 150 and 300 volts.
For grid-No.2 voltages between 150 and 300 volts.
Fastr Hearem-Cartnobs Voltadis.
Heater negative with respect to caltode.
Heater positive with respect to caltode.

megohm megohm

0.1 max 0.5 max

0.1 max 0.5 max

With external shield connected to cathode of unit under test except as noted.
 With external shield connected to ground.

For cathode-bias operation

Grid-No.1 Circuit Resistance:

Maximum Circuit Values:

For fixed-bias operation.

See curve page 70

0.5 max

See curve page 70 max volts 2 max watta

0 max 2.6 max

CRID-NO.2 VOLTAGE GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value. PLATE DISSIPATION

PLATE VOLTAGE. GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE. GRID-NO.2 VOLTAGE. Maximum Ratings, (Design-Center Values):

Pentode Unit 300 max 300 max

Triode Unit

300 max

Character late Sup

ristics:			
pply Voltage	200	200	ž
Voltage	۱ 4	ne.T	ĕi
1 Voltage	ę	1 6	¥ 7
Bias Resistor	, 0	P 1	5
tion Factor	0101	00000	-
sistance (Approx.)	0000	00000	5 1
ductance	3300	9000	
 Voltage (Approx.) for plate current of 10 μα 	-13	·	5
1 Voltage (Approx.) for transconductance of 100			
	1 +	0.77	Š
rrent	c r	0.0	
2 Current	ı	0	

0.25 max 1.0 max 0.5 max 1.0 max The dc component must not exceed 100 volts. Grid-No.1-Circuit Resistance:* For fixed-blas operation.... For eathode-bias operation....

Aaximum Circuit Values:

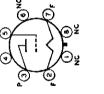
Grid-No.2

* The heater-cathode voltage should not exceed the value of the operating cathode bias. If the heater-ashode voltage exceeds the operating cathode bias value, grid No.3 will be made negative with respect costhode, and thus possibly cause a change in tube characteristics.

** If either unit is operating at maximum rated conditions, grid-No.1-circuit resistance for both units should not exceed the stated values.

POWER TRIODE

radio receivers and amplifiers. Maximum di-mensions: over-all length, 5-5/16 inches: seated height, 4-3/4 inches: diameter, 2-1/16 inches. Tube requires octal socket. For typical operation as a single-tube class A amplifier, refer to type 2A3. Filament volts (ac/dc), 6.3; amperes, amplifier: plate volts, 325; plate dissipation, 15 watts. Type 6B4-G is a DISCONTINUED Glass octal type used in output stage of 1.0. Maximum ratings as push-pull class AB₁ type listed for reference only.

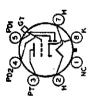


Glass type used as class A₁ power amplifier. One triode, the driver, is directly connected within the tube to the second, or output, triode. Outline 27, OUTLINES SECTION. Tube requires six-contact socket. Heater volts (ac/dc), 6.3; amperes, 0.8. Characteristics of input and DIRECT-COUPLED POWER TRIODE

ma., 8. Output triode: plate volts, 300 maz; plate ma., 45; plate resistance, 24000 ohms; load resistance, 7000 ohms; output watts, 4. This is a DISCONTINUED type listed for reference only. output triodes as class A: amplifier follow. Input triode: plate volts, 300 max; grid volts, 0; plate

TWIN-DIODE—HIGH-MU TRIODE

Glass octal type used as combined detector, amplifier, and ave tube. Outline 23, OUT-LINES SECTION. Tube requires octal socket. Heater volts (ac/dc), 6.3; amperes, 0.3. Within its triode maximum plate-voltage rating of 250 volts, this type is similar electrically to type 6SQ7 and curves under that type apply to the 6B6-G. This is a DISCONTINUED type listed for reference only.



REMOTE-CUTOFF PENTODE TWIN-DIODE-

tact (0.75-inch, pin-circle diameter) socket. Extrical characteristics of the 6B7 are identical Glass types used as combined detector, amplifier, and ave tubes. Outline 24B, OUTLINES cept for interelectrode capacitances, the elec-SECTION. These types fit the small seven-conwith those of type 6B8-G. Type 6B7S has the

P02(2)

general, its electrical characteristics are similar to those of the 6B7, but the two types are usually not directly interchangeable. These are DISCONTINUED types listed for reference only.

TWIN DIODE

SEMIREMOTE-CUTOFF PENTODE

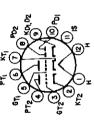
a sta

hos ofts

OULLINES SECTION. Type 6B8 is used principally for renewal purposes; 6B8-G is a DISCONTINUED type listed for reference only. Tubes require octal socket. Heater volts (ac/dc), 6.3; amperes, 0.3. Maximum ratings of Metal type 6B8 and glass octal type 6B8-G are used as combined detector, amplifier, and ave tubes. Outlines 3 and 23, respectively, OUTLINES SECTION. Type 6B8 is used

6B8

300 max; grid-No.2 volts, 125 max; grid-No.2 supply volts, 300 max; grid-No.1 volts, positive-bias value, 0 max; plate dissipation, 3.0 max watts (6B8), 2.25 max watts (6B8-G); grid-No.2 input, 0.3 max pentode unit as class A1 amplifier: plate volts,



MEDIUM-MU TWIN TRIODE TWIN DIODE-

Duodecar type used in television receivers; diode units are used in horiode units are used in horizontal-oscilzontal-phase-detector circuits, and trilator circuits.Outline 12A, OUTLINES

Related type:

8810

SECTION. Tube requires duodecar twelve-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.6; warm-up time (average), 11 seconds.

TRIODE UNITS AS CLASS AL AMPLIFIER

Values are for each unit		
Maximum Ratings, (Design-Maximum Values):		
PLATE VOLTAGE,	330 max	volts
DC CATHODE CURRENT.	20 max	ma
PLATE DISSIPATION.	3 max	watts
Peak Heater-Cathode Voltage:	į	
Heater negative with respect to cathode	200 max	volts
Heater positive with respect to cathode	$200^{\circ}max$	volts
Characteristics		
Plate Voltage	250	volts
Crid Voltage	89-	volts
Amplification Factor	18	
Plate Resistance (Approx.)	7200	ohms
Transconductance	2500	#mpos
Plate Current.	10	ma
Approx.) for pl	-20	volts
Maximum Circuit Values:		
Und-Under Kenstance: For fixed-bias operation	0.25 mar	megohm
For eathode-bias operation	1 max	megohm
DIODE UNITS (Each Unit)		
Maximum Rating, (Design-Maximum Value):		
PLATE CURRENT.	5 max	ma
PEAK HEATER-CATHODE VOLTAGE: Hoster negative with respect to cathode	200 max	volts
Heater positive with respect to cathode.	$200^{\circ} max$	volts
Characteristics, Instantaneous Value: Tube Voltage Drop for plate current of 20 ma.	rφ	volts
 The dc component must not exceed 100 volts. 		
Ι		

HALF-WAVE VACUUM RECTIFIER

vision receivers. Outline 10B, OUT-Novar type used as damper tube in horizontal-deflection circuits of tele-LINES SECTION. Tube requires

mounted in any position. Socket terminals 1, 3, 6, and 8 should not be used as tie novar nine-contact socket and may be

points. It is especially important that this tube, like other power-handling tubes, be adequately ventilated

volts amperes	ቯቯቯ
1.23	4. 4. 8. 1. 8.
Heater Voltage (ac/dc). Heater Current	DIRECT INTERELECTRODE CAPACITANCES, (Approx.): Plate to Cathode and Heater. Cathode to Plate and Heater. Heater to Cathode.

DAMPER SERVICE

For operation in a 525-line, 30-frame system

	volts	e H	ma	watts		volts	volts	
	5000 max	1000 max	165 max	5.3 max		2000 max	300°max	
Maximum Ratings, (Design-Maximum Values):	PEAK INVERSE PLATE VOLTAGE	PEAK PLATE CURRENT	DC PLATE CURRENT.	PLATE DISSIPATION	PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode	Heater positive with respect to cathode	

2 2 ■ The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

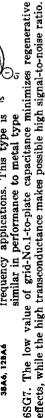
• The dc component must not exceed 900 volts.

D The de component must not exceed 100 volts.

REMOTE-CUTOFF PENTODE

38A6, 12BA6

frequency applications. This type is Miniature type used as rf ampliceivers, as well as in wide-band, highsimilar in performance to metal type fier in standard broadcast and FM re-



volts	ambere		7
6.3	8	With	K:rtorner
BATER VOLTAGE (AC/DC)	BATER CURRENT	Without	Caracage
EATER VO	EATER CU		

Without	Without	With	_
	External	External	
RECT INTERELECTRODE CAPACITANCES:	Shield	Shield	
Grid No.1 to Plate	0.0035 max	0.0035 max	ď
Grid No.1 to Cathode, Heater, Grid No.2 Grid No.3,			•
and Internal Shield.	5	5.55	ቯ
Plate to Cathode, Heater, Grid No.2, Grid No.3, and			•
Internal Shield	5.0	5.5	ቯ
With and and about a second of seconds			

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Maximum Values):

		 The dc component must not exceed 100 volts.
volts volts	200 max 200-max	Heater negative with respect to cathode. Heater positive with respect to cathode.
volts	0 max	Positive bias value Peak Heater-Cathode Voltage:
volts	-55 max	Negative bias value.
	1	GRID-No.1 (CONTROL-GRED) VOLTAGE:
See curve page 70	See cur	For grid-No.2 voltages between 165 and 330 volts
watt	0.7 max	For grid-No.2 voltages up to 165 volts.
		GRID-NO.2 INPUT:
watte	3.4 max	PLATE DISSIPATION.
volta	330 max	GRID-No.2 SUPPLY VOLTAGE.
See curve page 70	See cur	GRID-NO.2 (SCREEN-GRID) VOLTAGE.
volts	0 max	GRID-NO.3 (SUPPRESSOR-GRID) VOLTAGE, Positive value.
volts	330 max	PLATE VOLTAGE.

Characteristics	
Plate Supply Voltage	100 250
Grid No.3 and Internal Shield	Connected to cathone at so
Grid-No.2 Supply Voltage	100
Plate Registance (Approx.).	À
Transconductance Grid-No.1 Voltage (Approx.) for transconductance of 40 µmbos	4300 4400
Plate Current Grid-No.2 Current	10.8 11 4.4 4.2

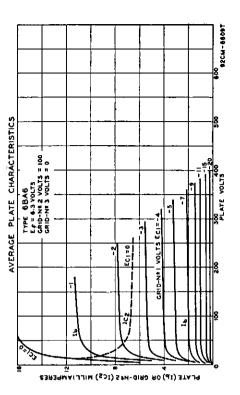
volts ohms gohm mhos volts

= Technical Data =

NSTALLATION AND APPLICATION

Type 6BA6 requires miniature seven-contact socket and may be mounted in any position. Outline 7B, OUTLINES SECTION

voltage, from a variable cathode-bias resistor, from the ave system, or from a Control-grid bias variation will be found effective in changing the volume of the receiver. In order to obtain adequate volume control, an available grid-No.1bias voltage of approximately 50 volts will be required. The exact value will depend depending on the receiver requirements, from a potentiometer across a fixed supply upon the circuit design and operating conditions. This voltage may be obtained, combination of these methods.



The grid-No. 2 (screen-grid) voltage may be obtained from a potentiometer or bleeder circuit across the B-supply source, or through a dropping resistor from the plate supply. The use of series resistors for obtaining satisfactory control of grid-No.2 voltage in the case of four-electrode tubes is usually impossible because of tically removes these effects, it is practical to obtain grid-No.2 voltage through a voltage, provided the source does not exceed the plate-supply voltage. With this method, the grid-No.2-to-cathode voltage will fall off very little from minimum to value is allowable because both the grid-No.2 current and the plate current are No.2 voltage from a higher voltage supply necessitates the use of the variable secondary-emission phenomena. In the 6BA6, however, because grid No.3 pracseries-dropping resistor from the plate supply or from some high intermediate maximum value of the resistor controlling cathode bias. In some cases, it may actually rise. This rise of grid-No.2-to-cathode voltage above the normal maximum reduced simultaneously by a sufficient amount to prevent damage to the tube. It should be recognized that, in general, the series-resistor method of obtaining gridcathode-resistor method of controlling volume in order to prevent too high a voltage on grid No.2. When grid-No.2 and control-grid voltage are obtained in this manner, the remote "cutoff" advantage of the 6BA6 can be fully realized. However, it should be noted that the use of a resistor in the grid-No.2 circuit will have an effect on the change in plate resistance with variation in grid-No.3 (suppressorgrid) voltage in case grid No.3 is utilized for control purposes.

Grid No. 3 (suppressor grid) may be connected directly to the cathode or it may be made negative with respect to the cathode. For the latter condition, the grid-No.3 voltage may be obtained from a potentiometer or bleeder circuit, or from

he ave system.

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	9	Ş	ì
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.2, Grid No.3, and In-	a ;	91 ·	ă
82	3.6 0.006 0.15 t.	0 000 0 000 0 023	5555
CLASS A, AMPLIFIER utings, (Design-Center Values):	Triode Unit 300 max	Pentode Unit 300 max	volts
UPPLY VOLTAGE.	1 1 1	300 max See curv -50 max	volts ve page 70 volts
sitive bias value § Dissiration No.2. Input:	2 max	0 max 3.26 max	volts
or grid-No.2 voltages up to 150 volts prid-No.2 voltages between 150 and 300 volts.	1.1	1 max See curve	watt e page 70
	200 max 200 max	200 max 200¶max	volts volts
stefnincs: Supply Voltage No.2 Supply Voltage No.1 Voltage	200	200 150 - 180	volts volts volts
	18 6700 2700 -16 -	400000 9000 -10 13 3 5	ohms µmbos volts ma
num Circuit Volues: No.1-Circuit Resistance: re fixed-bias operation. re eathode-bias operation. de component must not exceed 100 volts. Pp. 63-p. 63-p.	0.5 max 1.0 max	0.25 max 1.0 max	megohm megohm
TRIODE—TWIN PENTODE	ODE		
Duodecar type used as vertical ONT deflection oscillator and for combined sync-age applications in television re- ceivers employing series-connected heater strings. Outline 12B. OUT-	as vertical r combined elevision re- connected -2B. OUT-	6BAI	5
ES SECTION. Tube requires duodecar twelve-contact inted in any position. Heater volts (ac/dc), 6.3; amperes, rage), 11 seconds. For ratings and characteristics of pen 6HS8. TRIODE UNIT AS CLASS A, AMPLIFIER	re-contact :; amperes, tics of pen	decar twelve-contact socket and may be (ac/dc), 6.3; amperes, 0.6; warm-up time characteristics of pentode units, refer to CLASS A, AMPILIER	may be up time refer to
mum Ratings, (Design-Center Values): 3 Voltage Ace Currode Current Discourse		300 max 20 max	volts ma
ER-Carlode Vol.Age. Faster negative with respect to cathode Jeater positive with respect to cathode.		200 max 200 max	
orderistics: Voltage Voltage Movelage infeation Factor. Conductance Voltage (Approx.) for plate current of 100 µa. mum Circuit Values:		250 - 11 - 18 - 1800 - 18	volts volts rna rna volts
Circuit Resistance: Or flactabias operation. Or cathode-bias operation do component must not exceed 100 volts.		0.25 max 1 max	тевонт тевонт

MEDIUM-MU TRIODE

Miniature type used as an rf am-



volts SECTION. Tube requires miniature nine-contact socket and may be mounted in ampere Heater Voltage (ac/dc) Heater Current Plate to Heater and Cathode, Heater to Cathode............... quency range of 470 to 890 megacycles plifier in the cathode-drive circuits of per second. Outline 8A, OUTLINES uhf television tuners covering the fre-HEATER CURRENT. DIRECT INTERELECTRODE CAPACITANCES (Approx.): Grid to Plate. any position.

CLASS A, AMPLIFIER

対対対対

Maximum Ratings, (Design-Center Values):		
Prame Voltrage	250 max	volts
PLATE DISSIPATION	2.5 max	Watts
CATHODE CURRENT.	25 max	ma
PEAK HEATER-CATHODE VOLTAGE:	ì	-
Heater negative with respect to cathode	75 max	Volts
Heater positive with respect to cathode	75 max	volts
Characteristics:		
Plate Supply Voltage	150	volts
Cathode-Bias Resistor	100	ohms
Amplification Factor	48	
Plate Resistance (Approx.)	4800	ohms
	10000	mpoa m
Grid Voltage (Approx.) for plate current of 10 µa	-10	voits
Plate Current.	14.5	RITI
Maximum Circuit Valves:		

SHARP-CUTOFF PENTODE

For cathode-bias operation.....

Grid-Circuit Resistance: For fixed-bias operation...

Miniature type used in compact radio equipment as an rf or if amplifier at frequencies up to 400 megacycles per second. Outline 7B, OUTLINES SECTION. Tube requires miniature

Related types: 3BC5, 4BC5



Not recommended 0.5 max megohm

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seven-contact socket and may be mounted in any position. For typical operation as resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER SECTION.

To a second to the second seco	89	volts	
HEATER CURRENT.	0.3	атфеге	
DIRECT INTERELECTRODE CAPACITANCES:			
Pentode Connection:			
Grid No.1 to Plate	0.030 max	pi	
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	6.5	μ	
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	1.8	jd	
Triode Connection:*			
Grid No.1 to Plate and Grid No.2	2.2	ď	
Grid No.1 to Cathode, Heater, Grid No.3, and Internal Shield.	3.9	ď	
Plate and Grid No.2 to Cathode, Heater, Grid No.3, and Internal Shield	3.0	þĺ	

* Grid No.2 connected to plate.

= Technical Data

volts volts ve page 70 volts watts watt	volts volts	volts volts ohms megohm µmhos volts ma		ZTION.	volts ampere	ጀጀቯ	volts roa ma	volts volts ims.
Pentode Connection 300 max 300 max See curve 0 max 2 max 0.5 max See curve	90 max 90 max	125 250 125 150 100 180 0.5 0.5 0.8 6100 5700 - 8 7.5 2.4 2.1		6BC7 JNES SECT: ed in any posi	6.3 0.450	ကြက်က အက်အ	330 max 54 max 12 max	200 max 200 max plate is 560 ob
Triode Connection* 300 max 0 max 2.5 max	90 max 90 max	180 250 100 330 820 180 42 40 - 0.066 0.009 0.6 6000 440 490 5 8 6 4.7	ш	aning three is in one en- r circuits of Also used in a combina- tiline 8B, OUTL		Internal Shield. Internal Shield. Internal Shield.	:	ply impedance per p
CLASS A ₁ AMPLIFIER T Values): Y VOLTAGE AGE, Positive-bias value 150 volts E:	to cathodeto cathode) for plate current of 10 μa. ate.	TRIPLE DIODE	Miniature type containing three high-perveance diode units in one envelope; used in de restorer circuits of color television receivers. Also used in AM/FM radio receivers as a combinand AM detector tube. Outline 8B, OU tract miniature socket and may be mo	CAPACITANCES (Approx.):	No.1 Cathode, Heater, and No.2 Cathode, Heater, and No.3 Cathode, Heater, and	ier Values, Bach Diode Unit): ::	to cathode
CLASS A ₁ AMPLIFI CLASS A ₁ AMPLIFI PLATE VOLTAGE GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE. GRID-NO.2 VOLTAGE. GRID-NO.2 VOLTAGE. GRID-NO.2 VOLTAGE. GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value GRID-NO.2 INPUT. FOR ETIAL-NO.2 VORTAGES up to 150 volts. For grid-No.2 voltages up to 150 volts. For grid-No.2 voltages between 150 and 300 volts. PARK HEAPER-CATRODE VOLTAGE.	Heater negative with respect to cathode Heater positive with respect to cathode. Characteristics.	Plate Supply Voltage Gard-No.2 Supply Voltage Carthode-Blas Resistor. Amplification Factor Transconductance Gard-No.1 Voltage (Approx.) Flate Resistance (Approx.) Fransconductance Gard-No.1 Voltage (Approx.) for plate current of 10 µa Flate Current. * Grid-No.2 Current. * Grid No.2 connected to plate.		Holor Francisco Miniature type containing three high-perveance diode units in one envelope; used in de restorer circuits of color television receivers. Also used in AM/FM radio receivers as a combination and AM detector tube. Outline 8B, OUTLINES SECTION. Tube requires nine-contact miniature socket and may be mounted in any position.	HEATER VOLTAGE (AC/DC) HEATER CURRENT DIRECT INTERELEXTRODE CAPACITANIES (Approx.):	Diode-No.1 Plate to Diode-No.1 Cathode, Heater, and Internal Shield Diode-No.2 Plate to Diode-No.2 Cathode, Heater, and Internal Shield Diode-No.3 Plate to Diode-No.3 Cathode, Heater, and Internal Shield	Maximum Ratings, (Design-Cerler Values, Each Diode Unit): Peak Inverse Plate Voltage. Peak Plate Current DC Output Current Peak Harter-Cathobe Voltage:	Heater negative with respect to cathode

MEDIUM-MU TWIN TRIODE

Miniature type used in directcoupled cathode-drive rf amplifier circuits of vhf television tuners. In such circuits, one triode unit is used as the direct-coupled grounded-cathode driv-KT₁

er for the other unit. This type is also used in push-pull cathode-drive rf amplifiers. Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position.

HBATER VOLTAGE (AC/DC). HEATER CURRENT.		6.8 0.4	volts ampere
DIRECT INTERELECTRODE CAPACITANCES*:	Unit No.1	Unit No.2	,
Grid to Plate Grid to Cathode, Heater, and Internal Shield	N 49	XI 1	i'ā
Cathode to Grid, Heater, and Internal Shield	1	ro ro	ď
Plate to Cathode, Heater, and Internal Shield	1.3	1 -	ā.
Plate to Grid, Heater, and Internal Shield	ı	4.6	ā, 78
Flate to Cathode	67	200	, a
Plate of Unit No.1 to Plate of Unit No.2.	0.02	max	<u>ъ</u>
Plate of Unit No.2 to Plate and Grid of Unit No.1	¥0.0	max	ቪ
 With external shield connected to internal shield. 			

RCA Receiving Tube Manual

CLASS A, AMPLIFIER (Each Unit)

5000 max 300 max

Heater negative with respect to cathode. Heater positive with respect to cathode.

Peak Heater-Cathode Voltage:

Tube Voltage Drop for de plate current of 350 ma.

Characteristics, Instantaneous Value:

= Technical Data

Maximum Ralings, (Design-Maximum Values):		
PLATE VOLTAGE.	250 max	volts
PLATE DISSIPATION.	2.2 max	watts
CATHODE CURRENT.	22 max	m
PRAK HEATER-CATHODE VOLTAGE:		į
Heater negative with respect to cathode	200-max	VOITS
Heater positive with respect to cathode	200 max	volts
Characteristics		
Plate Supply Voltage	150	volts
Cathode-Bias Resistor.	220	ohma
Plate Resistance (Approx.)	5300	ohma
Amplification Factor	35	
Transconductance	6200	nupon
Grid Voltage (Approx.) for transconductance of 50 µmhos	-13	voits
Plate Current	10	ma

Maximum Circuit Value: Grid-Circuit Resistance .

* This rating may be as high as 300 volts under cutoff conditions, when the tube is used as a cascode amplifier and the two units are connected in series.

The dc component must not exceed 100 volts.

SHARP-CUTOFF BEAM TRIODE

DIRECT INTERELECTRODE CAPACITANCES:

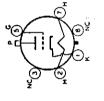
PLICATION SECTION.

megohm

0.5 max

Maximum ratings for voltage-control service: dc plate volts, 6BD4 20000 max, 6BD4-A 27000 max; unregulated dc supply volts, 6BD4 40000 lation of high-voltage, low-current de power max, 6BD4-A 55000 max; de grid volts, -125 Glass octal types used for the voltage regu-OUTLINES SECTION. Tubes require octal socket. Heater volts (ac/dc), 6.3; amperes, 0.6. supplies in color television receivers. Outline 25B,

> 6BD4A **6BD4**



max; peak grid volts, -550 max; dc plate ma., 1.5 max; plate dissipation, 6BD4 20 max watts, 6BD4-A 25 max watts; peak heater-cathode volts, 130 max. These are DISCONTINUED types listed for reference only.

REMOTE-CUTOFF PENTODE

radio receivers. This type is similar in performance to metal type 6SKT. Outline 7B, OUT-LINES SECTION. Tube requires miniature Miniature type used as rf or if amplifier in seven-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.3. Characteristics as class A: amplifier:

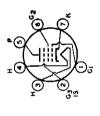


plate volts, 250 (300 max); grid No.3 connected

to cathode at socket; grid-No.2 volts, 100 (125

max); grid-No.1 volts, -3; plate resistance (apprex), 0.8 mesohm; transconductance, 2000 µmhos; plate (assipation, 3 max watts; grid-No.2 input, 0.65 max watt; plate ma., 9; grid-No.2 ma., 3; total cathode ma., 14 max; peak heater-cathode volts, 90 max. This type is used principally for renewal purposes.

HALF-WAVE VACUUM RECTIFIER

Duodecar type used as damper tube in horizontal-deflection circuits of television receivers. Outline 12D, OUTLINES SECTION. Tube re-

and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 1.2. quires duodecar twelve-contact socket

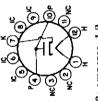
DAMPER SERVICE

a 525-line, 30-frame system	
For operation in	(Design-Maximum Values)
	Ratinas,
	aximum

Maximum Ratings, (Design-Maximum Values):	PEAK INVERSE PLATE VOLTAGE#	Peak Plats Current	DC PLATE CURRENT	PLATE DISSIPATION.
2	2	:	:	:
4	5		٠	•
Z	×	:	1	:
3	ĕ			:
:5	*			
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ma watts H

5000 max 1200 max 200 max 6.5 max



[ypical Operation (Separate Excitation):*

Plate Voltage
Grids-No.4 (Screen-Grid) Voltage
Grids-No.1 (O-genlator-Grid) Voltage
Grid-No.3 (Control-Grid) Voltage (ms)
Grid-No.3 (Control-Grid) Voltage
Grid-No.3 (Costlator-Grid) Resistor
Plate Resistance (Approx.)
Plate Resistance (Approx.)
Crid-No.3 (Voltage for conversion transconductance of 10 µmbos Plate Current Grids-No.2-and-No.4 Current Grid-No.1 Current. Cathode Current

Note: The transconductance between grid No.1 and grids No.2 and No.4 connected to plate (not oscillating) is approximately γ 250 unines under the following conditions; grids No.1 and No.6.3 at 0 volta; grids No.2 and No.4 and plate at 100 voltes. Under the same conditions, the cathode current is 25 ma, and the amplification factor is 20. Grid-No.1 voltage (Approx.) for plate current of 10 μ a is -11 volts. The dc component must not exceed 100 volts.

Type 6BE6 requires miniature seven-contact socket and may be mounted in Because of the special structural arrangement of the 6BE6, a change in signalany position. Outline 7B, OUTLINES SECTION.

volts ampere volts volts volts volts ohms megohm µmhos # The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 552-ling, 30-frame system, 15 per cent of one borizontal scanning cycle is 10 microseconds. = The dc component must not exceed 900 volts. sion of pentagrid types, see Frequency Conversion in ELECTRON TUBE AP-**6BE6** Related types: 3BE6, 12BE6 0.25 max 0.15 max 0.05 max 7.0 5.5 13.0 330 maz 110 maz 330 maz 1.1 maz -55 max 0 max 200 max 200 max External Shield With 2 -1.5 20000 Plate Dissipation
Cardone CambaNo.4 Input
Cardone Curbent
Grid-No.3 Voltage:
Negalive bias value
Positive bias value
Positive bis value. FLATE VOLTAGE. GRIDS-NO.2-AND-NO.4 (SCREEN-GRID) VOLTAGE. GRIDS-NO.2-AND-NO.4 SUIPLY VOLTAGE. Heater negative with respect to cathode. Heater positive with respect to cathode. in superheterodyne circuits in both the standard broadcast and FM bands. The 6BE6 is similar in performance to INSTALLATION AND APPLICATION Miniature type used as converter 0.80 max 0.15 max 0.10 max 7.0 5.5 8.0 metal type 6SA7. For general discus-External Shield PENTAGRID CONVERTER Heater Voltage (ac/dc) Heater Current. Grid No.3 to Plate
Grid No.3 to Flate No.1
Grid No.2 to Plate
Grid No.3 to Plate
Grid No.3 to All Other Electrodes
Grid No.1 to All Other Electrodes
Plate to All Other Electrodes
Grid No.1 to Cathode and Grid No.5
Cathode and Grid No.5 to All Other Electrodes With external shield connected to cathode and grid No.5. CONVERTER

Maximum Ratings, (Design-Maximum Values):

Grid No.

PLATE VOLTAGE.

volts volts volts watts

11 volts volts volts volts

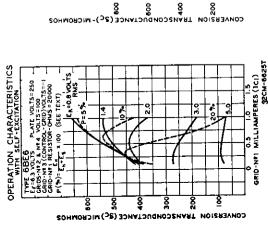
aaaaaa

* The characteristics shown with separate excitation correspond very closely with those obtained in a self-excited oscillator circuit operating with zero bias.

in the cathode circuit should produce little degeneration or regeneration of the on the signal grid produces little modulation of the electron current flowing in the cathode circuit. This feature is important because it is desirable that the impedance signal-frequency input and intermediate-frequency output. Another important feature is that, because signal-grid voltage has very little effect on the space charge ductance and in the input capacitance of grid No.1. There is, therefore, little grid voltage produces little change in cathode current. Consequently, an rf voltage near the cathode, changes in ave bias produce little change in oscillator transcondetuning of the oscillator by ave bias.

A typical self-excited oscillator circuit employing the 6BE6 is given in the CIRCUIT SECTION.

In the 6BE6 operation characteristics curves with self-excitation, \mathbf{E}_k is the voltage across the oscillator-coil section between cathode and ground; \mathbf{E}_k is the In the 6BE6 operation characteristics curves with self-excitation, oscillator voltage between cathode and grid



F. (F. 6.) VOLTS = 250 FLATE VOLTS = 250 GRID- WE 2. AN F4 VOLTS = 100 GRID- WE 3. CONTROL - GRID) VOLTS = 1.5 GRID- NE 1 RESISTOR - GRIDS - 1.5 GRID- NE 1 RESISTOR - GRIDS - 1.5 GRID- NE 1 GRESS - 1.5 GRESS - 1 92CM-6624T OPERATION CHARACTERISTICS WITH SEPARATE OSCILLATOR EXCITATION SRID-N*I MILLIAMPERES (ICI) CURRENT TYPE 6BE6 S3839MAI TRANSCONDUCTANCE (3C)-MICROMHOS CONVERSION

BEAM POWER TUBE

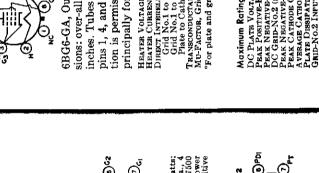
Miniature type used in audio output stage
of television and radio receivers. Triode-connected, it is used as a vertical deflection amplifor in television receivers. Outline 7C, OUTLINES SECTION. The requires miniature
seven-contact socket and may be mounted in
any position. Heater volts (ac/dc), 6.3; anperes, 1.2. Typical operation as class A, amplifer; plate volts, 110 (250 maz); grid-No.2 volts.
grid-No.2 input, 1.25 max watts; plate resistance (approx.), 12000 ohms; transconductance, 7500
amboos; plate load resistance, 2500 ohms; total harmonic distortion, 10 per cent; maximum-signal); plate resistance (approx.), 12000 ohms; transconductance, 7500
output, 1.9 watts; peak heater-eathode volte, 200 maz (de component 100 maz when heater is positive
with respect to cathode). This type is used principally for renewal purposes.

MEDIUM-MU TRIODE TWIN DIODE-

6BF6 Related type: 12BF6

Miniature type used in compact amplifier, and ave tube. The triode unit is particularly useful as a driver radio equipment as combined detector, for impedance- or transformer-coupled





= Technical Data =

output stages in automobile receivers. It is equivalent in performance to metal type 6SR7. Outline 7B, OUTLINES SECTION. Tube requires miniature sevencontact socket and may be mounted in any position.

Наятын Voltage (Ac/DC)	:	6.3	voits
HEATER CURRENT		0.3	ampere
Without	pnq	With	
H	_	Caternal	
DIRECT INTERELECTRODE CAPACITANCES: Shield		Shield	
Triode Grid to Triode Plate.		6 1	'n
Triode Grid to Cathode and Heater			17
Triode Plate to Cathode and Heater			ž 2
		06 mar	i e
Plate of Diode Unit No.2 to Triode Grid 0.06	0.06 max	0 05 max	1,2
			Ļ
TRIODE UNIT AS CLASS A, AMPLIFIER	HER		
Maximum Pations (Besign-Contex Voluse).			

r Values):	
(Destign-Cent	
Maximum Ratings,	PLATE VOLTAGE.

volts watts	volts volts		volts	volts		ohrns	anhos.	ma	opme	per cent	₽ E
300 max 2.5 max	90 max 90 max		250	Gi	16	8600	1900	9.0	10000		200
PLATE VOLTAGE. PLATE DISTRATION PLATE DISTRATION	Heater negative with respect to cathode Heater positive with respect to cathode	Typical Operation:	Plate Voltage.	Grid Voltage	Amplification Factor.	Plate Resistance (Approx.)	Transconductance	Plate Current	Load Resistance	Total Harmonic Distortion	Fower Output.

Fight Control (Barton Charlet)

The two diode plates and the triode unit have a common cathode. Diode biasing of the triode unit of the 6BF6 is not suitable. For diode operation curves, refer to type 6AV6. PLATE CURRENT (Each Unit)

DIODE UNITS

Maximum Rating:

88

1.0 max



BEAM POWER TUBE

Glass octal types used as output applications where high pulse voltages amplifier in horizontal-deflection circuits of television equipment and other

6BG6GA 6BG6G Related type: 198G6GA

sions: over-all length, 5-11/16 inches; seated height, 5-1/8 inches; diameter, 2-1/16 inches. Tubes require octal socket. They may be supplied with pins 4 and 6 or with pins 1, 4, and 6 omitted. Vertical tube mounting is preferred but horizontal operation is permissible if pins No.2 and 7 are in vertical plane. Type 6BG6-G is used occur during short duty cycles. Type 6BG6-GA, Outline 25A, OUTLINES SECTION. Type 6BG6-G maximum dimenprincipally for renewal purposes.

Heater Voltage (ac/dc)	ý
HEATER CURRENT.	0
DIRECT INTERELECTRODE CAPACITANCES: 6BG6-G	6.B
Grid No.1 to Plate.	Ö
Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3	_
Plate to Cathode, Heater, Grid No.2, and Grid No.3	ı
Transconductance	909
Mu-Factor, Grid No.2 to Grid No.1°	œ
Phone relate and emid-No 9 wolts 950, said No 1 walter 15	

volts ampere

, 250; grid-No.1 votts, -10. HORIZONTAL DEFLECTION AMPLIFIER

		9	7
	:	:	:
	:	:	
•	:	:	
•	:	um)	
Center Values):	VOLTAGE.	ITIVE-PUISE PLATE VOLTAGE* (Absolute Maximum)	JATIVE-PITSE PLATS VOLTAGE
		rate N	
	:	A 580	
atues		E E	AGE
ner V	:	VOLTA	Volt
Ratings, (Design-Center Values):	:	ATE	A.T.S.
Desig	:	BE PI	SE P
ngs,	TAGE	-PG	P-Pm
Rati	VOI.	TIVE	VITA:

ngs. (Design-Center Values): Ande: From max volts From max volts From by Voltage Plate Voltage (Absolute Maximum) From max volts From ma	For operation in a 525-line, JU-frame system		
700 max 6600* max 1500 max 350 max 400 max 110 max 20 max 3.2 max	(Design-Center Values):		
6600* max -1500 max 350 max -300 max 400 max 110 max 20 max 3.2 max		700 max	volts
-1500 max 350 max -800 max 400 max 110 max 20 max 3.2 max	AE PLATE VOLTAGE* (Absolute Maximum).	6600* max	volts
350 max -800 max 400 max 110 max 20 max 3.2 max	ILSE PLATE VOLTAGE	-1500 max	volts
-300 max 400 max 110 max 20 max 3.2 max	REN-CRID) VOLTAGE	350 max	volts
400 max 110 max 20 max 3.2 max	ULSE GRID-NO.1 (CONTROL-GRID) VOLTAGE	-800 max	voits
110 max 20 max 3.2 max	LNEER	400 max	ma
20 max 3.2 max	CURRENT	110 max	ma
3.2 max		20 max	watts
	•••••••••••••••••••••••••••••••••••••••	3.2 max	watts

volts volts

megohm ycle. In a

xcitation.

d as tie

g tubes,

volts

watts

volts volts sycle. In a

s minia-

ve page 70 volts Watte Watt ve page 70

megohm megohm

0.25 max 1.0 max

0.5 max 1.0 max

The de component must not exceed 100 volts. Grid-No.1-Circuit Resistance: For fixed-bias operation....... For cathode-bias operation.....

Maximum Circuit Values:

Heater negative with respect to cathode. Heater positive with respect to cathode. PEAK HEATER-CATHODE VOLTAGE:

90 max 90 max

Characteristics:

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

Miniature type used in a wide variety of applications in television receivers. This type has a controlled

Related type:

heater warm-up time for use in receivers employing series-connected

heater strings. The pentode unit is used as an if amplifier, a video amplifier, or an age amplifier. The triode unit is used in low-frequency oscillator circuits. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position.

volts ampere seconds	pi pi
6.8 11	2.4 2.6 0.38
EATER VOLTAGE (AC/DC) EATER VORRENT EATER WARN-UP TIME (Average) IRECT NARN-UP TAME (Average) IRECT NARN-UP TAME (Average)	node Unit: Grid to Pate Grid to Cathode and Heater. Plate to Cathode and Heater.

	4.6	# 0 81 81	000	0.046		4.0	000	100	0.030
DIRECT INTERELECTRODE CAPACITANCES (Approx.):	Triode Unit: Grid to Plate	Grid to Cathode and Heater.	Plate to Cathode and Heater	Grid No.1 to Plate.	Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	Triode Grid to Pentode Flate	Pentode Grid No., to Irlode Flate	Pentode Plate to Triode Flate

44444

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Center Values):	Triode Unil	Pentode Unit	
PLATE VOLTAGE. GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE. GRID-NO.2 VOLTAGE. GRID-NO.1 (CONTROL-GRID) VOLTAGE, POSITIVE-bias value. PLATE DISSIPATION.	300 max - 0 max 2.5 max	300 max volts 300 max volts See curve page 70 0 max volts 3 max watts	volts volts page 70 volts watts
GRID-NO.2 INPUT: For grid-No.2 voltages up to 150 volts. For grid-No.2 voltages between 150 and 300 volts.	1.1	1 max watt See curve page 70	watt page 70
Hater negative with respect to cathode. Heater positive with respect to cathode	200 max 200 max	200 max 200*max	volts volts
Parte Supply Voltage. Grid-No.2 Supply Voltage. Grid-No.2 Supply Voltage. Grid-No.1 Voltage. Arabide-Bias Resistor. Amplification Factor. Transconductance (Approx.) Transconductance Grid-No.1 Voltage (Approx.) for plate current of 100 µa. Grid-No.2 Current.	150 -5 -5 17 5150 3300 -14 9.5	200 125 - 82 15000 7000 15 3.4	volts volts volts ohms µmhos volts ma

REMOTE-CUTOFF PENTODE



TION. Tube requires miniature seven-contact socket and may be mounted in any position.

ampere 0,0035 max 6.3 0.15 Grid No.1 to Plate. Grid No.1 to Cathode, Heater, Grid No. 2, Grid No. 3, and Internal Shield Plate to Cathode, Heater, Grid No. 2, Grid No. 3, and Internal Shield... Heater Voltage (ac/dc)..... Miniature type used as rf amplifier in high-frequency and wide-band applications. Features high transconductance and low grid-to-plate capacitance. Outline 7B, OUTLINES SEC-DIRECT INTERELECTRODE CAPACITANCES: HEATER CURRENT....

Without external shield, or with external shield connected to cathode.

	300 max volts	See curve page 70	300 max volts	3 max watts		0.6 max watt	See curve page 70		-50 max	0 max volts		90 max volts	90 max volts
Maximum Ratings, (Design-Center Values):	PLATE VOLTAGE.	GRID-No.2 (SCREEN-GRID) VOLTAGE	GRID-No.2 SUPPLY VOLTAGE,	PLATE DISSIPATION.	GRID-NO.2 INPUT:	For grid-No.2 voltages up to 150 volts	For grid-No.2 voltages between 150 and 300 volts	GRID-NO.1 (CONTROL-GRID) VOLTAGE:	Negative bias value	Positive bias value	Prak Heater-Cathode Voltage:	Heater negative with respect to cathode	Heater positive with respect to cathode

Characteristics:			
Plate Voltage	100	250	volts
Grid No.3.	Connec	Connected to cathode at socket	e at socket
Grid-No.2 Voltage	100	100	volts
Grid-No.1 Voltage	-1.0	-1.0	volt
Plate Resistance (Approx.)	0.25	1.3	megohms
Transconductance	3650	3600	#mbos
Grid-No.1 Voltage (Approx.) for transconductance of 10 ambos	-20	-20	volts
Plate Current.	0.6	67.	E CL
Grid-No.2 Current	3.5	67	8 01

Each diode has a separate cathode.

흕

Miniature type used as a dc-rechannels of color-television receivers. storer tube in each of the three signal TRIPLE DIODE

Tube requires miniature nine-contact socket and may be mounted in any position. Outline 8B, OUTLINES SECTION Heater volts, 6.3; amperes, 0.45.

DC RESTORER SERVICE

Maximum Ratings, (Design-Center Values, Each Diode Unit): PEAK INV PEAK PLA DC OUTPA PEAK HE/ Heate

330 mar	10 max	1 max		330 max	100 max
WERSE PLATE VOLTAGE	LATE CURRENT	PPUT CURRENT	EATER-CATHODE VOLTAGE:	ater negative with respect to cathode	ater positive with respect to cathode

volts

rolts m Ē

= Technical Data



MEDIUM-MU TRIODE TWIN DIODE-

Miniature type used in a wide variety of applications in black-andwhite and color television receivers. The diode units are used in phase-

own cathode with individual base-pin terminal to provide for flexibility of circuit connections. Outline 8D, OUTLINES SECTION. Tube requires miniature ninetector or discriminator, and horizontal afe discriminator circuits. The triode unit is used in phase-splitter, audio-frequency amplifier, and low-frequency oscillator applications; it may also be used as a vertical-deflection amplifier in compact portable television receivers. This type has a controlled heater warm-up time for use in receivers employing series-connected heater strings. Each of the three units has its detector, phase-comparator, ratio-decontact socket and may be mounted in any position.

volts

ጀጀቪ

volts ampere seconds	pp p	EEEEEE
6.3 0.6 11	2.6 2.8 0.31	1.9 4.6 0.06 max 0.07 max 0.11 max 3.0 4.8
Heater Volts (ac/dc) Heater Current Heater Wahm-Up Time (Average) Direct Interestrode Capacitances:	Grid to Plate Grid to Cathode and Heater Plate to Cathode and Heater Diode Units:	Plate to Cathode and Heater (Each Unit) Cathode to Plate and Heater (Each Unit) Plate of Unit No.1 to Plate of Unit No.2 Plate of Unit No.1 to Triode Grid Plate of Diode Unit No.2 to Triode Grid Plate of Bicher Diode Unit to All Other Electrodes Cathode of Either Diode Unit to All Other Electrodes

TRIODE UNIT AS CLASS A1 AMPLIFIER

Values):
(Design-Maximum
Ratings,
Maximum

GRAP POULAGE, Positive-bias value Average Cathode Current Player Dissipation Player Hence Cathode Voltage:	330 max 0 max 22 max 4 max	volta volta ma watts
Heater negative with respect to cathode. Heater positive with respect to cathode.	200 max 200 max	volts volts
Characteristics:		

AVERAGE CHARACTERISTICS

volts

95

80

Plate Voltage Grid Voltage

								700
TYPE 68J8								909
TYPE E _f = 6.								200
						100/00/00/00/00/00/00/00/00/00/00/00/00/		400 VOLTS
			:	- 0,	37.			300 400 PLATE VOLTS
		1 /4	رة دريم الم					200
	0	. 23 EC	10A 014	9			1	901

ŝ PLATE MILLIAMPERES

= RCA Receiving Tube Manual

ohms µmbos volts ms
20 7150 2800 -18 8 1.7
22 4700 4700 -7 13.5
Ante Reasitance (Approx.) Thate Reasitance (Approx.) Franconductance. Frid Voltage (Approx.) for plate current of 10 µa. Tate Current. Tate Current for grid voltage of -12.5 volts.

Aaximum Circuit Value:

The dc component must not exceed 100 voits. 3rid-Circuit Resistance...

megohm

1 max

TRIODE UNIT AS VERTICAL DEFLECTION AMPLIFIER

For operation in a 525-line, 30-frame system

Kaximum Ratings, (Design-Maximum Values):

volts volts volts ma	ma watts	volts volts
830 max 1200 max -275 max 77 max	22 max 4 max	200 max 200 max
DC PLATE VOLTAGE PEAR POSITIVE-PULSE PLATE VOLTAGE † PEAK POSITIVE-PULSE GRID VOLTAGE PEAK CATHORD CHERRY	AVERAGE CATHODE CURRENT PLATE DISSIPATION	Peak Heater-Cathod Vollage: Heater negative with respect to cathode Heater positive with respect to cathode.

Maximum Circuit Value:

Grid-Circuit Resistance: For cathode-bias operation.....

2.2 max megohms

DIODE UNITS

Maximum Ratings, $(Design ext{-}Maximum\,Values)$:

54 max	THUE	200 max	$200^{\bullet}max$	esanning evels. In a
Plate Current (Each Unit): Peak	Average	PEAK HEATER-CATHODE VOLTAGE: Unater meretive with vernect to cathode	Heater positive with respect to cathode	The state of the s

volts volts

в 525-

ma

† The duration of the voltage pulse must not exceed 15 per cent of one vertical scanni line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

The dc component must not exceed 100 volts.

SHARP-CUTOFF BEAM TRIODE

age regulation of high-voltage, low-Glass octal type used for the voltcurrent de power supplies in color television receivers. Outline 25A, OUT-LINES SECTION. Tube requires octal socket and may be mounted in any position.



9 C	1 8	90.0 0		10006	2007
Heater Voltage (ac/dc)	Heater Current	Grid to Plate	Grid to Cathode and Heater	Plate to Cathode and Heater	AMPLIFICATION FACTOR (Applox.)

VOLTAGE-CONTROL SERVICE

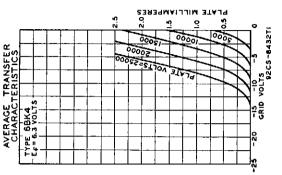
27000 max volts 60000 max volts -135 max volts 1.6 max volts 25 max watts 200 max volts Not recommended	
Maximum Ratings, (Design-Maximum Values): DG Plate Voltage DG Read DC Supely Voltage DG Grap Voltage Prak Grid Voltage Plate Dissipation Plate Dissipation Plate negative with respect to eathode Heater negative with respect to eathode.	

Maximum Circuit Value:

3 max For interval of 20 seconds maximum duration during equipment warm-up period. Grid-Circuit Resistance: For use with "Flyback Transformer" bigh-voltage supply.....

megohms

= Technical Data



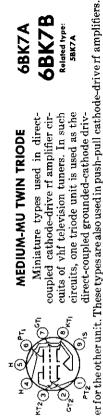
BEAM POWER TUBE

of television and radio receivers. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted No.1 volts, -ō; peak af grid-No.1 volts, 5; plate fier: plate and grid-No.2 volts, 250 max; grid-Miniature type used in audio output stages in any position. Heater volts (ac/dc), 6.3; amperes, 1.2. Typical operation as class A₁ ampli-

12BK5, 25BK5

Related types:

(maximum-signal); plate resistance (approx.), 0.1 megohm; transconductance, 8500 µmhos; load resistance, 6500 ohms; total harmonic distortion, 7 per cent; power output, 3.5 watts; peak heater cathode volts, 100 max. This type is used principally for renewal purposes. dissipation, 9 max watts; grid-No.2 input, 2.5 max watts; plate ma., 35 (zero-signal), 37 (maximum-signal); grid-No.2



volts

ampere

ಕ್ಷಕ್ಷ

MEDIUM-MU TWIN TRIODE

6BK7A

Miniature types used in directcircuits, one triode unit is used as the direct-coupled grounded-cathode drivcoupled cathode-drive rf amplifier circuits of whf television tuners. In such

6BK7B Related type: 5BK7A

ploying require typical IPLED	volts ampere seconds pf pf pi
eceivers em ON. Tubes sition. For ANCE-COU	6.3 0.45 0.45 11 7744 No. 3 1.8 0.9 6.9
Type 6BK7-B has a controlled heater warm-up time for use in receivers employing series-connected heater strings. Outline 8B, OUTLINES SECTION. Tubes require miniature nine-contact socket and may be mounted in any position. For typical operation as a resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER SECTION. Type 6BK7-A is a DISCONTINUED type listed for reference only.	(/nit/No. 1 1.8 1.3 1.1 2.4
warm-up time 8B, OUTLIN y be mounted plifier, refer to 7-A is a DISC	HEATER VOLTAGE (AC/DC) HEATER WARNUT HEATER WARNUT TIME (AVERGE) for 6BK7-B. Init No. Init No. Grid to Plate Grid to Cathode, Heater, and Internal Shield. Plate to Cathode, Heater, and Internal Shield. Cathode to Grid, Heater, and Internal Shield. Cathode to Grid, Heater, and Internal Shield. Cathode to Grid, Heater, and Internal Shield. Plate to Grid, Heater, and Internal Shield.
heater war Outline 8E and may I bled amplifi pe 6BK7-A	TER VOLTAGE (AC/DC) FER CURRENT XI INTERELISETRODE CAPACITANCES: Grid to Plate Grid to Cathode, Heater, and Internal Shield. Plate to Cathode, Heater, and Internal Shield. Cathode to Grid, Heater, and Internal Shield. Plate to Grid, Heater, and Internal Shield.
tentrolled later strings. tact socket stance-coupl TION. Typ	HEATER VOLTAGE (AC, DC) HEATER CURRENT HEATER WARN-UP TIME (Average) for 6BK7-B- JHECT INTERELECTRODE CAPACITANCES: Grid to Plate Grid to Cathode, Heater, and Internal Shie Plate to Cathode, Heater, and Internal Shie Cathode to Grid, Heater, and Internal Shie Plate to Grid, Heater, and Internal Shiele Plate to Grid, Heater, and Internal Shiele
K7-B has a nnected her e nine-con a as a resis FIER SEC	TER VOLTAGE (AC/O TER CURRENT TER WARN-UP TIMN WARN-UP TIMN Grid to Plate Grid to Cathode, H Plate to Cathode, B Plate to Grid, Heaf
Type 6BK7-B series-connecter miniature nine operation as a AMPLIFIER reference only.	HEATER VO HEATER CO HEATER W DIRECT IN Grid t Grid t Plate

RCA Receiving Tube Manual

watts watts

10 max 12 max

10 max 12 max

Technical Data

volts volts

200 max

200 max

200 maz

Heater negative with respect to cathode....... Heater positive with respect to cathode......

For either plate... For both poth units operating.

PLATE DISSIPATION:

PEAK HEATER-CATHODE VOLTAGE:

200 max

megonme

4.7 max

Plate to Cathode 0.22 0. Heater to Cathode 2.8 2.8 Grid of Unit No.1 to Grid of Unit No.2 0.0 0.0 Plate of Unit No.1 to Plate of Unit No.2 0.0 0.0	0.22 3 0.004 max 0.075 max	i i i i
CLASS A, AMPLIFIER (Each Unit) No ximum Ratinas. (Desim-Center Values):		
	300 max	volts
	-50 max	volts
	2.7 max	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200*max	volts
	$200^{\bullet}max$	volts
Characteristics:		
Plate Supply Voltage	150	volts
Cathode-Bias Resistor.	26	ohms
Amplification Factor	43	
	4600	ohms
	9300	*mpos
	18	ETI-
	-11	volts
In cathode-drive circuits with direct-coupled drive, it is permissible for this voltage to be as high as	age to be as	high as

The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

Under no circumstances should this absolute value be exceeded.

Unless otherwise specified, values are for each unit.

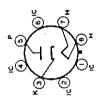
Maximum Circuit Values: Grid-Circuit Registance. The dc component must not exceed 100 volts.

For cathode-bias operation.

The dc component must not exceed 100 volts. 300 volts under cutoff conditions.

HALF-WAVE VACUUM RECTIFIER

Heater volts (ac/dc), 6.3; amperes, 3. Maximum ratings for damper service: peak inverse plate volts (absolute maximum), 4500 max; Glass octal type used as a damper tube in horizontal deflection circuits of color television receivers. Maximum dimensions: over-all length, 4-5/8 inches; seated height, 4-1/16 inches; diameter, 1-5/8 inches. Tube requires octal socket. peak plate ma., 1200 max; de plate ma., 200



tive with respect to cathode (de component must not exceed 900 volts); 300 max when heater is positive with respect to cathode (de component must not exceed 100 volts). This is a DISCONTINUED type maz; plate dissipation, 8 maz watts; peak heater-cathode volts, 4500 absolute maz when heater is negalisted for reference only.

MEDIUM-MU TWIN TRIODE

KT2 Glass octal types used as combined tical deflection oscillator in television receivers. When so operated, it is vertical deflection amplifier and ver-

6BL7GTA

6BL7GT

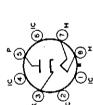


require octal socket and may be mounted in any position. Type 6BL7-GT is a DISCONTINUED type listed for reference only. 5, and 6) be used as the oscillator. Outline 14C, OUTLINES SECTION. Tubes recommended that unit No.1 (pins 4,

HEATER VOLTAGE (AC/DC) HEATER CHERENT	6.3	volts
DIRECT INTERELECTRODE CAPACITANCES (Approx.): Unit No. 1 6-14 to Plate 6	Unit No. 2	ŭ
Grid to Cathode and Heater 4.2 Plane to Cathode and Heater 9.9	4.0 9.0	o o,
AMPLIFICATION FACTOR* PLATE RESISTANCE (ADDIOX.)*	15 2150	ohms
Transconductange* * Each unit; for plate volts, 250; grid volts, -9; plate ma., 40.	7000	зоqшт

VERTICAL DEFLECTION OSCILLATOR OR AMPLIFIER*

	tor Amplifier	rx 500 max	2000 max		rx 210 max	12 60 max
30-frame system	Oscillator	500 max	11km) —	400 max	210 max	60 max
For operation in a 525-line, 30-frame system	· Values):	DC PLATE VOLTAGE	Peak Positive-pulse Plate Voltaget (Absolute Maximum).	PEAK NEGATIVE-PUISE GRID VOLTAGE	PEAK CATHODE CURRENT	AVERAGE CATHODE CURRENT
For 0	Maximum Ratings, (Design-Center Values):	/OLTAGE	IVE-PULSE PLATE VOLT	IIVE-PULSE GRID VOLI	ODE CURRENT	ATHODE CURRENT
	Maximum Re	DC PLATE V	PEAK POSITI	PEAK NEGAT	PEAK CATHO	AVERAGE CA



CLASS A, AMPLIFIER Maximum Ratings, (Design-Center Values): PLATE VOLTAGE....

Related type:

Miniature type used in frequency-

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

Tube requires miniature nine-contact

socket and may be mounted in any

position. Heater volts (ac/dc), 6.3; amperes, 0.45.

changer service in television receivers. Outline 8B, OUTLINES SECTION.

Š

550 max 250 max 550 max max max200 14 550 max 250 max 14 max With cathode current less than 10 ma..... Plate Supply Voltage.... GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE..... CATHODE CURRENT..... With cathode current of 14 ma. GRID-NO.2 VOLTAGE: GRID-NO.2 INPUT:

100 max 100 max 0.5 max 0.75 max 1.7 max 100 max 100 max 1.5 max Heater positive with respect to cathode...... Heater negative with respect to cathode..... PEAK HEATER-CATHODE VOLTAGE: PLATE DISSIPATION.,

watts

volta volts

Watt watt

volts volts

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•			
That A Valteria	444	ě,	•
Liste Youtalke	201	2	Volts
Grid-No.z Voltage	1	1.20	volta
	,		
Grid-No.1 Voltage	7-	7	volts
Ammlification Restor	90	;	
THE PROPERTY IS NOT THE PROPERTY OF THE PROPER	1	1	
Mu-Factor, Grid No.2 to Grid No.1	ı	47	
Plate Resistance (Approx.)	1	9.0	megohm
	1		1
Transconductance	5000	6200	anhoa
Plate Current,	14	10	m
Cald No 9 Commont		0	
Gradinota Current	ı	9	B E
Input Resistance at frequency of 50 Mc	1	0.01	megohm
Entivation Noise Registrance	ı	1500	, made
יייייייייייייייייייייייייייייייייייייי		2001	
Maximum Circuit Values:			



volts volts

ä

MEDIUM-MU TRIODE

0.5 max megohm 1 max megohm

0.5 max 0.5 max

For cathode-bias operation. Grid-No.1-Circuit Resistance:

For fixed-bias operation.

television tuners. The double base-pin Miniature types used as rf amplifier tubes in grid-drive circuits of whf connections for both cathode and grid reduce effective lead inductance and

6BN4A Related types: 6BN4

2BN4A, 3BN4A

RCA Receiving Tube Manual

lead resistance with consequent reduction in input conductance. In addition, the basing arrangement facilitates isolation of input and output circuits and permits short, direct connections to base-pin terminals. Outline 7B, OUTLINES SECTION. ntagt socket and may be mounted in any position.

Tubes require miniature seven-contact socket and may be incomed. Type 6BN4 is a DISCONTINUED type listed for reference only.		
HEATER VOLTAGE (AC/DC)	6.3 0.2	voli
DIRECT INTERELECTRODE CAPACITANCES (Approx.):*	27	_
Grid to Plate	67 -	
Plate to Cathode and Heater	*	-

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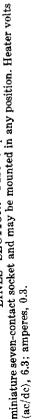
		at out		,			ax volts	and and the		41014	80108	opma		- 1 -	STHEO	Soque	volts	ma			az megonm
		200 m	7nm ()	2 2 max	22 max		100 max	100 200	100	-	e i	220	43	2	0400	7700	9-	σ:		,	0.5 max
* With external shield connected to cathode.	CLASS A, AMPLIFIER	Maximum Ratings, (Design-Center Values):	Plats Voltage	GRID VOLTAGE, Positive-bias value	:	CATHODE CURRENT	PEAR HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode	Heater positive with respect to cathode	Characteristics:	Dist. Susply Voltage	Flate-Supply voices	Cathode-Bias Resistor	Amplification Factor	Tilt Desirtance (America)	Flace resistance (Approx)	Transconductance	(irid Voltage (Approx.) for place current of the	Plate Current,	Maximum Circuit Value:	Grid-Circuit Resistance

BEAM TUBE

SECTION. Tube requires limiter, discriminator, and audio-voltand FM receivers. Outline 7C, OUT-Miniature type used as combined age amplifier in intercarrier television LINES

6BN6

Related types: 3BN6, 4BN6



LIMITER AND DISCRIMINATOR SERVICE

##[c.,		estion man of		10 1/202		200 mater voits		
Maximum Ratings, (Design-Maximum Values):	PLATE-SUPPLY VOLTAGE	GRID-No.2 Voltage,	GRID-No.1 VOLTAGE, Positive peak value	CATHODE CURRENT	PEAK HEATER CATHODE VOLTAGE:	Heater negative with respect to cathode	Heater positive with respect to cathode	O The dc component must not exceed 100 volts.

TWIN DIODE—HIGH-MU TRIODE

6BN8 Related type: 88V8

Miniature type used in a wide black-and-white television receivers. This type has a controlled heater warm-up time for use in receivers emvariety of applications in color and

ploying series-connected heater strings. The triode unit is used in burst-amplifier, af amplifier, and low-frequency oscillator applications. The diode units are used

= Technical Data

in phase-detector, ratio-detector or discriminator, and horizontal AFC discriminator circuits. Outline 8D, OUTLINES SECTION. Tube requires miniature ninecontact socket and may be mounted in any position.

volts ampere seconds pf pf pf pf pf		voits voits watts	volts volts	volts volts	ohms umhos volts	тегорш		m #m	volts volts
6.3 0.6 3 8.6 0.06 max 0.07 max 1.9 6 4.8		330 max 0 max 1.7 max	200 max 200 max	250 1-3	70 28000 2500 -5.5 1.6	1.0 max		54 max 9 max	200 max 200 max
HEATER VOLTAGE (AC/DC) HEATER CURRENT THATEN WARE UP TIME (Average) DIRECT INTERELLECTOR CAPACITANCES: Triode Grid to Triode Plate Triode Grid to Triode Plate Triode Grid to Cathode and Heater Plate of Diode Unit No.1 to Triode Grid Plate of Diode Unit No.2 to Triode Grid Plate of Diode Unit No.2 to Triode Grid Plate of Diode Unit So.2 to Triode Grid Diode Cathode to All Other Electrodes (Each Diode Unit) Diode Cathode to Diode Plate and Heater (Each Diode Unit) Diode Plate to All Other Electrodes (Each Diode Unit)	TRIODE UNIT AS CLASS A1 AMPLIFIER	Maximum Rafings, (Design-Maximum Values): Platts Voltage, Positive bias value Grio Voltage, Positive bias value Park Herres-Carlor Voltage:	Heater negative with respect to cathode Heater positive with respect to cathode	Characteristics: Plate Voltage Grid Voltage	21000 3500 -2.5 1.5	Maximum Circuit Value: Grid-Circuit Resistance	DIODE UNITS Maximum Ratings, (Design-Maximum Values):	Prate Current (Each Unit): Peak Dic	EATER-CATHODE V ter negative with re ter positive with re ic component must

AVERAGE CHARACTERISTICS TRIODE UNIT

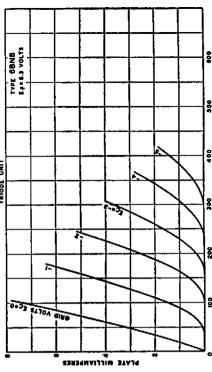


PLATE VOLTS

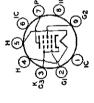
92CM-9563T

= RCA Receiving Tube Manual ==

POWER PENTODE

6BQ5 Related type: 88Q5

stage of audio-frequency amplif Tube requires miniature nine-con Outline 8E, OUTLINES SECTI socket and may be mounted in Miniature type used in the ou position.



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put ers. ON. tact

Glas	_	Vision rec	2	tal socket	position.	with pin	GT is a D
• • • • • •	<u>_</u>		ر آ	きくし)*) <u>y</u>	۳ ئ

BEAM POWER TUBE

= Technical Data

s octal types used as horiflection amplifiers in tele-

6BQ6GT 6BQ6GTB	/6CU6
-------------------	-------

volts	đ.	, ,	804m4	та., 2.1.
	9.0	2	5900 4.3	7; grid-No.2
HEATER VOLTAGE (AC/DC). HEATER CURRENT.	DIRECT INTERELECTRODE CAPACITANCES (Approx., 6BQ6-GTB/6CU6); Grid No.1 to Plate. Grid No.1 to Capacitance Grid No. 2 and Grid No.2	Plate to Cathode, Heater, Grid No.2, and Grid No.3.	TRANSCONDUCTANCE* (6EQG-CTB/6CU6) MU-FACTOR, Grid No.2 to Grid No.1**	* For plate volts, 256; grid-No.2 volts, 150; grid-No.1 volts, -22.5; plate ma., 57; grid-No.2 ma., 2.1. ** For plate and grid-No.2 volts, 150; grid-No.1 volts, -22.5.

ACITION AND INTERPRETATION AND INTERPRETATION

volts

100 max 100*max

Reater negative with respect to cathode.

PEAK HEATER-CATHODE VOLTAGE:

CATHODE CURRENT

Heater positive with respect to cathode...........

▲ The dc component must not exceed 100 volts.

(ypical Operation:

GRID-No.2 INPUT. PLATE DISSIPATION....

GRID-NO.2 (SCREEN-GRID) VOLTAGE. GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value.

E

65 max

watts watts

2 max300 max 300 max

0 max 12 max

volts voits

Maximum Circuit Value:

250 250 -7.3 6.2 48 50.6 5.5 10 38000 11300 4500

Peak AF Grid-No.1 Voltage
Zero-Signal Plate Current.
Maximum-Signal Plate Current
Zero-Signal Grid-No.2 Current

Zero-Signal Grid-No.2 Current.
Maximum-Signal Grid-No.2 Current.

Grid-No.2 Voltage. Grid-No.1 (Control-Grid) Voltage.

Plate Voltage.....

Transconductance

Maximum-Signal Power Output.........

Fotal Harmonic Distortion

volts volts E C Ħ BOL Ë

0.47 max megohm Grid-No.1-Circuit Resistance.....

• The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a \$35-line, 30-farms system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

† Under no circumstances should this absolute value be exceeded.

An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

The dc component must not exceed 100 volts.

ohms µmhos

ohma

per cent



megohm

0.3 max 1.0 max

For fixed-bias operation...-

Grid-No.1-Circuit Resistance:

Maximum Circuit Values:

For eathode-bias operation.....

PUSH-PULL CLASS AB, AMPLIFIER

Maximum Ratings: (Same as for single-tube class A₁ ampliffer)

Plate Supply Voltage..... Grid-No.2 Supply Voltage.....

[ypical Operation, (Values are for two tubes):

megohm

MEDIUM-MU TWIN TRIODE

6BQ7

circuits, one triode unit is used as the Miniature types used in directcoupled cathode-drive rf amplifier circuits of vhf television tuners. In such direct-coupled grounded-cathode driv-



Outline 8B, OUTLINES SECTION. Tubes require miniature nine-contact socket amplifier, refer to RESISTANCE-COUPLED AMPLIFIER SECTION. Type er for the other unit. These types are also used in push-pull cathode-drive rf amplifiers. and may be mounted in any position. For typical operation as a resistance-coupled 6BQ7 is a DISCONTINUED type listed for reference only.

> volts ohms volts

ohms

watts

per cent

108

H H

300 300 1130 72 72 92 8 8 22 3000

250 250 130 22.6 62 62 75 7

Zero-Signal Plate Current. Maximum-Signal Plate Current Zero-Signal Grid-No.2 Current Cathode-Bias Resistor.

Maximum-Signal Grid-No.2 Current......

Effective Load Resistance (Plate-to-plate) Potal Harmonic Distortion

Maximum-Signal Power Output.....

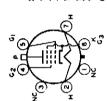
		:
	e c	volta
Unit No.1	it No.2	
1.2	1.2	ā
Grid to Cathode, Heater, and Internal Shield 2.6	ı	ā
Cathode to Grid, Heater, and Internal Shield	5.0	ă,
Plate to Cathode, Heater, and Internal Shield	. 1	ā
Plate to Grid, Heater, and Internal Shield	61	ā
0.12	0.12	ā.
Heater to Cathode (6BQ7-A)2.6	2.6	Δ,
Plate of Unit No.1 to Plate of Unit No.2 0.010 max		ā
Plate of Unit No.2 to Plate and Grid of Unit No.1 0.024 max		Ä.

megohm megohm

0.3 max 1.0 max

Grid-No.1-Circuit Resistance:

Maximum Circuit Values:



12BQ6GTB/12CU6, 178Q6-GTB, 25BQ6GTB/25CU6 seivers. Outline 15C, OUT-ECTION. Tubes require ocand may be mounted in any These types may be supplied No.1 omitted. Type 6BQ6-ISCONTINUED type listed for reference only.

volts

ampere

HRATER VOLTAGE (AC/DC)......

DIRECT INTERELECTRODE CAPACITANCES:

HEATER CURRENT.

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0.5 max 10.8 6.5 0.25 max

Grid No.1 to Heater.............

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Center Values):

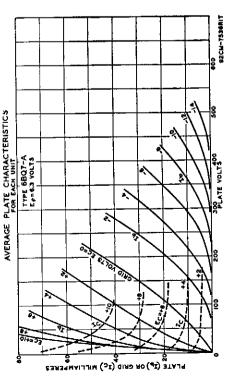
PLATE VOLTAGE.

CLASS A, AMPLIFIER (Each Unit)

Maximum Ratings, (Design-Center Values): PLATE SUPPLY VOLTAGE THATE DISSIPATION CATRODDE CURRENY	250*max 2 max 20 max	volts watts ma
Peak Heater-Carhode Volfages Heater negative with respect to cathode Hater positive with respect to cathode	200*max 200=max	volta volta
Characteristics: 6BQ7 Plate Supply Voltage: 150 Cathode-Bias Resistor 220	68Q7-A 150 220	volts obms
	5900 6400 9	ohme 4mhos ma
Grid Voltage (Approx.) Proplate current of $100~\mu a$ Proplate current of $100~\mu a$ — 10 For plate current of $10~\mu a$ — -10	-6.5 -	volta
Maximum Circuit Value: Grid-Circuit Resistance	0 .5 max	megohm

* In eathode-drive circuits with direct-coupled drive, it is permissible for this voltage to be as high as 300 volts. With external shield connected to internal shield.

The dc component must not exceed 100 volts.



6BR8

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE

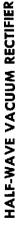
Especially useful as combined triode Miniature types used in a wide variety of applications in color and black-and-white television receivers.

6BR8A

Related type:

5BR8

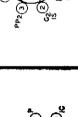
television tuners. Type 6BR8-A has a controlled heater warm-up time for use in SECTION. Except for basing arrangement and grid-No.1-to-plate capacitance of receivers employing series-connected heater strings. Outline 8B, OUTLINES pentode unit, these types are identical with miniature types 6U8 and 6U8-A, oscillator and pentode mixer in vhf



respectively.

in horizontal-deflection circuits of Tube requires novar nine-contact sock-Novar type used as damper tube black-and-white television receivers. Outline 10D, OUTLINES SECTION. Related hypes: 12853, 17B53





- Technical Data

et and may be mounted in any position. Socket terminals 1, 3, 6, and 8 should not be used as tie points; it is recommended that socket clips for these pins be removed to reduce the possibility of arc-over and to minimize leakage. It is especially important that this tube, like other power-handling tubes, be adequately ventilated

can our our order much boner handing onder, he adequately ventilated.	ALLY VERILLE	
HEATER VOLTAGE (AC/DC) HEATER CURENT. HEATER CURENT. DIRECT INTERELECTRODE CAPACITANCES (Approx.): Plate to Cathode and Heater Cathode to Plate and Heater Heater to Cathode	ରଳ ନ ସ ଅନ୍ୟ ନହର	volts amperes pf pf pf
DAMPER SERVICE For operation in a 525-line, 30-frame system Aoximum Ratings, (Design-Maximum Values):		
Peak Inverse Plate Voltage Peak Plate Current DC Plate Current Plate Dissipation	5000 max 1100 max 200 max 6 max	volts ma ma wattg
Peak Harter-Cathons Voltakos Heater negative with respect to cathode Heater positive with respect to cathode.	5000 • max 300 ¤max	volts volts
Characteristics, Instantaneous Value: Tube Voltage Drop for plate current of 140 ma	12	volts

■ The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 523-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

■ The de component must not exceed 900 volts.

■ The de component must not exceed 100 volts.



^K72⊙

MEDIUM-MU TWIN TRIODE

Miniature type used in directcircuits, one triode unit is used as the coupled cathode-drive rf amplifier circuits of whf television tuners. In such

6BS8

Related type:

\$

Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket This type is also used in push-pull cathode-drive rf amplifiers. and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.4. direct-coupled grounded-cathode driver for the other unit.

CLASS A, AMPLIFIER (Each Unit)

volts watts ma	volts	volta ohma	ohma µmhos na volts
150 max 2 max 20 max	200 max 200 max	150 220	$^{36}_{7200}$
Maximum Ratings, (Design-Center Values): PLATE VOLLAGE PLATE DISSIPATION ÇATHODE CURRENT	FBAK HENTER-CATHODE VOLAGES. Heater negative with respect to cathode. Heater positive with respect to cathode.	Characteristics: Plate-Supply Voltage Cathode-Bias Resistor.	Plate Resistance (Approx.) Plate Resistance (Approx.) Plate Current. Grid Voltage (Approx.) for plate current of 10 μa^*

SHARP-CUTOFF TWIN PENTODE

0.5 max megohm

Grid-Circuit Resistance..... * This value applies to unit No.2 only.

Maximum Circuit Value:

sync separator, sync clipper, and age amplifier tube in television receivers. Miniature type used as combined Tube requires miniature nine-contact socket and may be mounted in any Outline 8D, OUTLINES SECTION

position.

6BU8 Related types: 3BU8, 4BUB

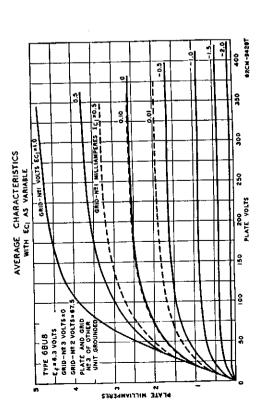
RCA Receiving Tube Manual ==

volts ampere	ដូចជួច
6.8 0.8	1.9 6 3.6 3 0.015 max
HEATEN VOLTAGE (AC/DC) HEATEN CURENT	DIRECT INTERRIECTRODE CAPACITANCES: Grid No.3 to Plate (Each Unit). Grid No.1 to All Other Electrodes. Grid No.3 to All Other Electrodes (Each Unit). Plate to All Other Electrodes (Each Unit). Grid No.3 so (Unit No.1 to Grid No.3 of Unit No.2

CLASS A, AMPLIFIER Values

	volts			voice			>	1114	•		volte		
	300 max	5	30 mar	-b0 max	TOTAL OF	TPM MGT	TDW OC-	772 77	1 1 200	1.1 mar	200	900	107 mm
Maximum Katings, (Design-Maximum Values):	PLATE VOLTAGE (Each Unit)	GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE (Each Unit):	Peak positive value	DC negative value	DC positive value	GRID-No.2 (SCREEN-GRID) VOLTAGE	GRID-No.1 (CONTROL-GRID) VOLTAGE, Negative bias value	CATHODE CURRENT.	GRID-No.2 INPUT.	PLATE DISSIPATION (Each Unit)	PEAK HEATER-CATRODE VOLTAGE:	Heater negative with respect to cathode	Heater positive with respect to cathode

Characteristics: With Both Units Operating	6		
State Ifair)	100	100	volts
Plate vertage (Each Chit)		0	volts
Circle No. 3 Volume Case Cont.)	_	67.5	volta
Grid-INo.2 Voltage		۰	volta
Grid-No.1 Volument (Flock Physic)	1	61 63	ma
Figure Centrem (trace) control (trace)	6.5	60	ma
Child-Mode Current	9.9	7.8	E118
Control of the state of the sta	-		
With One Unit Operating		•	- 41
Dieto Veltano	100	100	voits
	0	9	volte
Cirigation Values	67.5	67.5	volts
CINCLINOS VOICES		*	volta
CITATION OF The second sections of the section sections of the second sections of the second sections of the second section section sections of the second section sections of the section section section section sections of the section	1	180	Bodma
Cardal No. o Transcondinatence	1500	ŀ	*uho
Chicago Antonia de Company de Com	,	61 61	e CE
Clare Current.	,	1 4	volta
Grid-No.1 Voltage (Approx.) for plate current of 100 µa		-2.3	volts



= Technical Data =

		0.5 max megohm	o o max megohm	
Maximum Circuit Values: Grid-No.3-Circuit Resistance (Each Unit) Grid-No.1-Circuit Resistance	Maximum Circuit Values:	Grid-No.3-Circuit Resistance (Each Unit).	Grid-No.1-Circuit Resistance	a mile de commence a manage and promoted 100 and to

■ The dc component must not exceed 160 volts.
* Adjusted to give a dc grid-No.1 current of 100 microamperes.
† With plate and grid No.3 of the other unit connected to ground.

		GRID-NET VOLTS#67.5 GRID-NET MILLIAMPERES # 0.1	GRID NES					,			400 \$26M-9429T
	TYPE SBUS	20-M22 VOI 110-M21 MIL 20.1	PLATE AND GRID Nº3 OF OTHER UNIT GROUNDED						1		350
	H7 -5:3	2.2						(8)		\int	300
ERISTICS MBLE	#	/					/*	-63		/	550
AVERAGE CHARACTERISTICS WITH EC.3 AS VARIABLE	<i>H</i>			7.		<u> </u>				7	ZDO PLATE VOLTS
ERAGE (<i>\frac{\frac{1}{2}}{2}</i>	/	/		\(\frac{1}{2}\)	POT E	W.0/b.			7	051 •
₹	H	/								7	8
	\Box	//	3								05
	<u> </u>	43									s
	5.5 	<u> </u>	0		139MAI ĀĪ		374.19	,			



MEDIUM-MU TRIODE TWIN DIODE-

synchronous detector and chrominance Miniature type used as combined amplifier in color television receivers; also used as combined FM detector and af voltage amplifier. Tube has con-

ر ق

6BV8

LINES SECTION. Tube requires miniature nine-contact socket and may be operated in any position. Heater volts (ac/dc), 6.3; amperes, 0.6; warm-up time trolled warm-up time for use in series-connected heater strings. Outline 8B, OUT-(average), 11 seconds.

	330 max volts 0 max volts 2.7 max watts 200 max volts	200 volts - volts 330 ohms 590 ohms 5500 µmbos 11 volts	0.1 max megohm 0.5 max megohm
TRIODE UNIT AS CLASS A, AMPLIFIER	Maximum Ratings, (Design-Maximum Values): PLATE VOLTAGE GRD VOLTAGE, Positive-bias value. PLATE DISSIRATION. PLATE BLISSIRATION PLATE HEATER-CATHODE VOLTAGE: HEATER negative with respect to cathode. Heater positive with respect to cathode.	Characteristics: 75 Plate Voltage. 75 Grid Voltage. 0 Cathode Residence. 0 Amplification Factor. - Plate Resistance (Approx.) - Transconductance. - Plate Current. - Grid Voltage (Approx.) for plate current of 100 µa. -	Maximum Circuit Values: Grid-Circuit Resistance: For fixed-bias operation. For cathode-bias operation

Values are for each unit Maximum Ratings, (Design-Maximum Values):

volts volts ma

= Technical Data

megohm megohm

0.1 max 0.5 max

volts volts

5 max 200 max 200°max

200 max 200°max 10 max 'n PEAK HEATER-CATHODE VOLTAGE

Reater negative with respect to cathode

Heater positive with respect to cathode Characteristics, Instantaneous Test Condition: Tube Voltage Drop for plate current of 23 ma PLATE CURRENT

volts volts Ę

volts

"The dc component must not exceed 100 volts.

FULL-WAVE VACUUM RECTIFIER

Related type: 12BW4

Miniature type used in full-wave requires miniature nine-contact socket power supplies having high dc out-OUTLINES SECTION. Type 6BW4 put current requirements. Outline 8D,

and may be mounted in any position. It is especially important that this tube, like other power-handling tubes, be adequately ventilated. Heater volts (ac/dc), 6.3;

FULL-WAYE RECTIFIER

į	1275 max	450 max	350 max	62.5 max	z maz	450 max		Choke	006	ı	t :	10	001	360	
Maximum Ratings, (Design-Center Values):	PRAK INVERSE PLATE VOLTAGE	AC PLATE SUPLY VOLTAGE (Per Plate, rms)	STEADY-STATE PEAK PLATE CURRENT (Per Plate)	DC Output Current	TRANSIENT PEAK PLATE CURRENT (Per Plate)	DC HEATER-CATHODE VOLTAGE:	regief negative with respect to the production of the production o	Typical Operation: Fitter Input	upply Voltage (rms)*6	With I have Canadian				DC Output Voltage at Input to Filter (Approx.) 330	 AC plate supply voltage is measured without load.

SHARP-CUTOFF PENTODE TWIN DIODE-

6BW8 Related type:

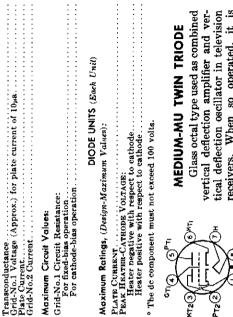
age keyer. Outline 8B, OUTLINES 602 Poz Pe phase detectors; pentode is used as a Miniature type used in television receivers; diodes are used as horizontal sound if amplifier, sound limiter, and

socket and may be operated in any position.

PENTODE UNIT AS CLASS A: AMPLIFIER

Maximum Ratings, (Design-Maximum Values):

Draw Volumen	SSO max
COLLAND STREET VILLE VOLTAGE	330 max
GRID-NO.2 Voltage	See curve p
GRID-NO.1 (CONTROL-GRID) VOLTAGE:	-
Positive-bias value	THE PERSON
Negative-bias value	799 GG-
GRID-NO.2 INPUT:	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
For grid-No.2 voltages up to 165 volts	771 CC ()
For grid-No.2 voltages between 165 and 330 volts	See carve p
PLATE DISSIPATION	o mer
PEAK HEATER-CATHODE VOLTAGE:	000
Heater negative with respect to cathode	2000
Heater positive with respect to cathode	200 TREE



MEDIUM-MU TWIN TRIODE

vertical deflection amplifier and ver-Glass octal type used as combined tical deflection oscillator in television receivers. When so operated, it is

5, and 6) be used as the oscillator. Outline 14C, OUTLINES SECTION. Tube recommended that unit No.1 (pins 4, requires octal socket and may be mounted in any position.

voits	#III Det co	ohms	WILLIAM S
en 4	201	1300	
HEATER VOLTAGE (AC/DC).	AMPLIPICATION FACTOR*	PLATE RESISTANCE (Approx.)*	TRANSCONDUCTANCE

* For plate volts, 250; cathode-bias resistor, 390 ohms; plate ma., 42.

volts

µf

ohms

henries

volts

volts volts ma Ħ amperea VERTICAL DEFLECTION OSCILLATOR OR AMPLIFIER (Each Unit)

For operation in a 525-line, 30-frame system	ame system		
Maximum Ralings, (Design-Center Values):	Oscillator	Amplifier	
DC PLATE VOLTAGE.	500 max	500 max	volts
Peak Positive-Pulse Plate Voltage			
(Absolute Maximum)#	1	2000-max	Volts
PEAK NEGATIVE-PULSE GRID VOLTAGE.	-400 max	-250 max	volts
Peak Cathode Current	180 max	180 max	EQ1
AVERAGE CATHODE CURRENT.	60 max	60 max	80H
PLATE DISSIPATION:			
For either plate.	10 max	10 max	watts
For both plates with both units operating	12 max	12 max	Watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200 max	200 max	volts
Heater positive with respect to cathode	200° max	200° max	volts

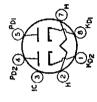
Maximum Circuit Values:

2.2 max megohms # The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a \$525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

* Under no circumstances should this absolute value be exceeded. 2.2 max Grid-Circuit Resistance....

The de component must not exceed 100 volts.

For eathode-bias operation.



watt page 70 watts

volts volts

volts volts

volts volts page 70

FULL-WAVE VACUUM RECTIFIER

tional power-supply applications. Outline 19A, OUTLINES SECTION. Tube requires octal socket and may be mounted in any position. It Octal type having high perveance used as a damper tube in horizontal deflection circuits of is especially important that this tube, like other television receivers or as a rectifier in convenpower-handling tubes, be adequately ventilated. Heater volts (ac/dc), 6.3; amperes, 1.6. Maxi-

6BY5GA

peak plate ma., 525 mur; de plate ma., 175 mur. Peak heater-cathode volts: heater negative with respect to cathode, 450 mur; heater positive with respect to cathode, 100 mur. This type is used principally for mum ratings for damper service (each unit): peak inverse plate volts (absolute maximum), 3000 maz; renewal purposes.

volts volts ohms megohm

250 110 68 0.25

Plate Voltage Grid-No.2 Voltage Cathode-Blas Kesistor Plate Resistance (Approx.)

Characteristics:

RCA Receiving Tube Manual =

= Technical Data =

PENTAGRID AMPLIFIER



·/	\$ 5 E	nted in	volts	ampere	þ	þď	ρί	ď.	E E	
		may be mou		0.3	0.08 max		0	4.0	5 t-	
TENTAGRIC STRICT	Miniature type used as a gated amplifier in color television receivers. In such service, it may be used as a combined sync separator and sync elipper. Outline 7B, OUTLINES SEC-	TION. Tube requires miniature seven-contact socket and may be mounted in any position.	HEATER VOLTAGE (AC/DC)	HEATER CURRENT	DIRECT INTERELECTRODE CAPACITANCES: Grid No.1 to Plate.	Grid No.3 to Plate.	Grid No.1 to Grid No.3,	Grid No.1 to All Other Electrodes	Grid No.3 to All Other Electrodes.	The company of the co
	6BY6 Related type: 3BY6	TION. Tube re any position.	HEATER VOLTAGE (A	HEATER CURRENT.	DIRECT INTERELECT	Grid No.3 to Pla	Grid No.1 to Gri	Grid No.1 to All	Grid No.3 to All	

volts volts volts volts umbos

GATED AMPLIFIER		
Maximum Rafings, (Design-Maximum Values):		
PLATE VOLTAGE.	330 max	volts
GRIDS-NO.2-AND-NO.4 VOLTAGE,	See curve page 70	page 70
GRIDS-NO.2-AND-NO.4 SUPPLY VOLTAGE.	330 max	volts
GRID-No.3 VOLTAGE:		
Negative bias value	-55 max	volts
Positive his value	0 max	volts
Ponitive neak value	27 max	volts
CRIP-No.1 Vol. 146E. Negative bias value	-110 max	volts
PLATE DISSIPATION	2.3 max	watts
GRID-No.3 INPUT	0.1 max	watt
GRIDS-No.2-AND-No.4 INPUT:		4

volts volts volts watts watt watts

See curve page 70

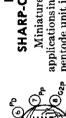
1.1 max 0.1 max

For grids-No.2-and-No.4 voltages up to 165 volts.

For grids-No.2-and-No.4 voltages between 165 and 330 volts.

TYPE 68Y6 GRID-NH VOLTS=-25	GRIDS - N#2 L N#4 VOLTS#100		_													į
23H3	4MV17	אור	(*	+2	> z)	<u>_</u>	N T	ZEN	1-9		_			-		
<u></u>	9	<u>}</u>		ļ	•	<u> </u>		•	أ	<u> </u>			9-			ŀ
		٦	~ ;			GRID-NES VOLTS ECSE-4							_			
	,	,,		١		٦							_	ľ		١
		Ĺ				6 a 4	L		ľ	<u></u>	1			\parallel		١
VOLTS EC3=-10	ij	ľ	L	1		88		L	١		Ц			Į.		
15.T		ľ	ŀ	Ľ		ļ_	1		1		1			\parallel		1
Š		i.	Ϊ	L		ļ	1	-			Ц	_		╣		
CRID-NE 3	Li	į	Ц	L	1	L	1			ļ	Ľ	_		4		
81	<u> </u>		Ц	L	1		_				I.b	1	L	4		1
L		Ľ	4	Ĭ	1	L		_		1_	-	Ļ		1		-
L į	, i	L	1		7	Ļ		lacksquare		1	-	1		4		4
) j / j	ľ	_	ļ	_	1	7	7	_	\perp	<u> </u>	_	L	_	<u> </u>	4

GRID-No.1 INPUT.	0.1 max	watt
Feath Instance with respect to cathode	200 max	volta
Heater positive with respect to cathode	$200^{\circ}max$	volts
Characteristics as Sync Separator and Sync Clipper:		
Plate Voltage	01	volts
Grid-No.3 Voltage	0	volts
Grids-No.2-and-No.4 Voltage	52	volts
Grid-No.1 Voltage	0	volts
Plate Current	1.4	ma
Grids-No.2-and-No.4 Current.	es ro	ma
Grid-No.3 Volts (Approx.) for plate voltage of 25 volts, grids-No.2-and-No.4		
voltage of 25 volts, grid-No.1 voltage of 0 volts, and plate current of 50 μ a	2.5	volts
Grid-No.1 Volts (Approx.) for plate voltage of 25 volts, grids-No.2-and-No.4		
voltage of 25 volts, grid-No.3 voltage of 0 volts, and plate current of 50 µa	හ වෝ	volts
Maximum Circuit Values:		
Grid-No.1 or Grid-No.3-Circuit Resistance:	, 1	
For eathode-bias operation	1,0 max	megohm
"The dc component must not exceed 100 volts.		ı



₹G

SHARP-CUTOFF PENTODE DIODE-

and the high-perveance diode as a applications in television receivers. The Miniature type used in diversified pentode unit is used as an rf amplifier

limiter or detector. This type has a controlled heater warm-up time for use in receivers employing series-connected heater strings. Outline 8D, OUTLINES SECTION. Tube requires miniature ninecontact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.6; warm-up time (average), 11 seconds.

volts volts

8 E

AMPLIFIER	
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CLASS	
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E N	
PENTODE	
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_	ζ

PLATE VOLTAGE GRID-NO.3 (SUPPRESSOR-GRID) VOLTAGE, POSITIVE VAIUE GRID-NO.2 (SGEREIN GRID) SUPPLY VOLTAGE GRID-NO.2 VOLTAGE GRID-NO.2 VOLTAGE GRID-NO.1 (CONTROL-GRID) VOLTAGE: Negative bias value		
GRID-NO.3 (SUPPRESSOR-GRID) VOLTAGE, POSITIVE VALUE GRID-NO.2 (SCREEN GRID) SUPPLY VOLTAGE GRID-NO.2 VOLTAGE, GRID-NO.2 VOLTAGE, NO.2 VOLTAGE, NEERIVE bias value	300 mar	volts
GRID-NO.2 (SOUTHERSON-MIL) VOLTAGE. GRID-NO.2 (SOUTHERS ORD) SUPPLY VOLTAGE. GRID-NO.2 (CONTROL-GRID) VOLTAGE. Nogative bias value		at los
GRID-NO.Z (SCREBN GRID) SUPPLY VOLTAGE. GRID-NO.J (CONTROL-GRID) VOLTAGE: Negative bis value.	ç	1
GRID-NO.2 VOLTAGE. GRID-NO.3 (CONTROL-GRID) VOLTAGE: Negative bias value.	٠	
GRID-NO.1 (CONTROL-GRID) VOLTAGE: Negative bias value.		see carve page 70
Negative bias value.		
	Į.	volta
Positive hise welve		volte
D. And Market and Co.		*****
FLATE DISSIPATION		* 4.00
GRID-NO-2 INPUT:		
For grid-No.2 voltages up to 150 volts.	0	watt
Roy and No 2 voltages between 150 and 300 volts		See curve have 70
Date Harmon Annual Volument		8
LEAN LINEAL DESCRIPTION OF THE PARTY OF THE		-414
Heater negative with respect to cathode	200 max	10 ·
Heater positive with respect to cathode		VOITE
Characteristics		
Plate Sunnly Voltage	250	volts
	Connect to eathode at socket	at enclose
901	150	a learner
Grd-No.2 Supply Voltage	001	2010.
	89	ohms
	-	megohm
¢.	5200	my with
A COLONIAL CARLOS AND) 	-
different votesge (approx.) for place current of the part.	3.01	
	0.0	##
Grid-No.2 Current, Z.1	4 . 5	Ë
Maximum Circuit Values:		
		moreon
For fixed-bias operation.	Thursday.	
For cathode-bias operation		
The de component must not exceed 100 volts.		
TINE BOOK		
maximum katings, (Design-Center Values):		٠
PEAK INVERSE PLATE VOLTAGE		volts
PEAR PLATE CURRENT.		ma
DC PLATE CURRENT	. 45 maz	EE
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode	200 max	VOICE
Heater positive with respect to cathode		
The de component most not exceed 100 volts.		

SEMIREMOTE-CUTOFF PENT

6BZ6 Related types:

3BZ6, 4BZ6, 12BZ6

External Shield 0.025 max trolled video if stages of televi SECTION. Tube requires minia seven-contact socket and may Miniature type used in gainreceivers. Outline TB, OUTLI DIRECT INTERELECTRODE CAPACITANCES: Grid No.1 to Plate... Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Plate to Cathode, Heater, Grid No.2, Grid No.3, and Inmounted in any position. nternal Shield ternal Shield

G		
ODE	con- ision NES ature	

€. Si

volts ampere External Shield* 0.015 max

4BZ7

circuits, one triode unit is used as the

cuits of vhf television tuners. In such

Miniature type used in directcoupled cathode-drive rf amplifier cir-

MEDIUM-MU TWIN TRIODE

= Technical Data =

direct-coupled grounded-cathode driv-

6BZ7 Related type:

and may be mounted in any position. For typical operation as a resistance-coupled er for the other unit. This type is also used in push-pull cathode-drive rf amplifiers. Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket amplifier, refer to RESISTANCE-COUPLED AMPLIFIER SECTION. Heater volts (ac/dc), 6.3; amperes, 0.4.

CLASS A, AMPURER (Each Unit)

•	
	Values):
	(Design-Center
	Ratings,
	Maximum

Ē

A A	EUI .		STIDA	oo hinh oo
250*max 2.0 max	ZO max	200*max	20000000	notion to be
Plate Voltage. Plate Dissipation	CATHODE CURRENT.	Heater negative with respect to cathode	Heater positive with respect to cathode	and the second of the second o

*In cathode-drive circuits with direct-coupled drive, it is permiss 300 volts under cutoff conditions.

The dc component must not exceed 100 volts. **Characteristics**:

volts

0 max 2.3 max 330 max

See curve page 70

FLATE VOLTAGE
GRID NO.3 (SUPPRESSOR-GRID) VOLTAGE, Positive Value
GRID NO.3 (SUPPRESSOR-GRID) SUPPLY VOLTAGE,
GRID-NO.2 (VOLTAGE,
GRID-NO.1 (CONTRIGG-GRID) VOLTAGE, Positive bias value
PLATE DISSIPATION
CRID-NO.1 (CONTRIGG-GRID) VOLTAGE, POSITIVE DISSIPATION
CRID-NO.1 (VOLTAGE)

330 max 0 max

CLASS A. AMPLIFIER

Maximum Ratings, (Design-Maximum Values): With external shield connected to rathode.

voits ohms	ohms 4mhos	wolts	,	megohm	
150 220	5300 6800	25		0.6 max	
Plate Supply Voltage Cathode-Bias Resistor	Amplification Factor. Plate Resistance (Approx.) Transcendictance	Plate Current Grid Voltage (Approx.) for plate current of 100 µs.	Maximum Circuit Value:	Grid-Circuit Resistance	AVERAGE CHARACTERISTICS

volts volts

200 max 200∎max

For grid-No.2 voltages up to 165 volts.

For grid-No.2 voltages between 165 and 330 volts.

FAR EMARGATIONE VOLTAGE.

Heater negative with respect to cathode.

Heater positive with respect to cathode.

GRID-NO.2

Characteristics:

0.55 max wath See curve page 70

Charlocheratics:

Plante Supply Voltage
Grid No.3

Grid No.3

Cathode-Bias Resistor

Transconductance (Approx.)

Cathode-Bias Resistor

Grid No.4

Cathode-Bias Resistor

Grid No.5

Franconductance (Approx.)

Solid magohn

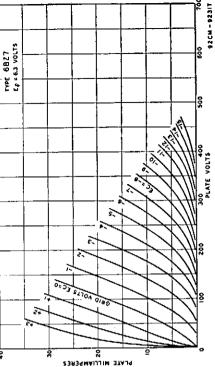
Grid No.1 Voltage (Approx.) for transconductance of 50 mmhos

-19 volts

Grid No. 2 Supply Voltage
Cathode-Bias Resistor.
Plate Resistance (Approx.).
Transconductance (Approx.)
Grid-No.1 Voltage (Approx.) for transconductance of 50 µmhos and cathode resistor of 0 ohms

Flate Current.

EACH UNIT



megohm megohm

0.25 max 1.0 max

For fixed-bias operation.

The de component must not exceed 100 volts.

Grid-No.1-Circuit Resistance: Maximum Circuit Values:

AVERAGE CHARACTERISTICS

volta

E E

MEDIUM-MU TWIN TRIODE

GRID-NEI VOLTS ECIE-I

(IP) OR CHID-HES (ICS)



as the direct-coupled, grounded-cathode driver for the other unit. Outline 8B, OUTLINES SEC-TION. Tube requires miniature nine-contact Miniature type used in direct-coupled, cathode-drive, rf amplifier circuits in vhf television uners. In such circuits, one triode unit is used socket. Heater volts (ac/dc), 6.3; amperes, 0.4. Characteristics as class A: amplifier (each unit):

6BZ8

plate supply volts, 125 (250 max); cathode-bias

PLATE VOLTS

resistor, 100 ohms; amplification factor, 45; plate resistance (approx.), 5600 ohms; transconductance, 8000 amhos; plate ma. 10; exthode ma., 20 mar.; plate dissipation, 2.2 maz watts; peak heater-cathode volts, 200 mar. Type 6528 is used principally for renewal purposes.

POWER TRIODE

Miniature type used in compact in FM and other high-frequency circuits. It may also be used as a class C radio equipment as a local oscillator rf amplifier. In such service, it delivers



cycles per second. Outline 7B, OUTLINES SECTION. Tube requires miniature power output of 5.5 watts at moderate frequencies, and 2.5 watts at 150 megaas a resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLI-FIER SECTION. For additional curve of plate characteristics, refer to type seven-contact socket and may be mounted in any position. For typical operation 12AU7-

volts ampere	aal aal be
6.3	With External Shield* 1.4 1.8 2.5
12AU (-A.) Haaten Vorrage (AC/DC) Heaten Current	Without Barenal Grid to Plate Grid to Cathode and Heater Flate to Cathode and Heater Plate to Cathode and Heater With external shield connected to cathode.

CLASS AT AMPLIFIER		
Maximum Ratings, (Design-Center Values):		
PLATE VOLTAGE.		volta
PLATE DISSIPATION,	3.5 max	watta
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max	volts
Heater positive with respect to cathode		volts
Characteristics:		
Plate Voltage.	100 250	volts
Grid Voltage*	08.5	volts
	.5 17	
		ohms
	3100 2200	#mpos
	11.8 10.5	ma
	-10 -25	volts
* Transformer- or impedance-type input coupling devices are recommended to minimize resistance in	nended to minimize res	stance in

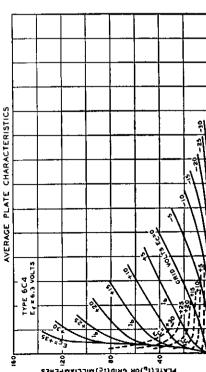
Maximum Circuit Values: Grid-Circuit Resistance:

the grid circuit.

For fixed bias operation The de component must not exceed 100 volts.

megohm megohm

0.25 max 1.0 max



RF POWER AMPLIFIER AND OSCILLATOR—Class C Telegraphy

= Technical Data

Maximum Ralings, (Design-Center Values):

volts volts	ma ma watts	-1101	volta	B E	watt watte
300 max -50 max	25 max 8 max 5 max	008	(C)	64 FO E-	0.35 5.5
Piate Voltage. Grid Voltage.	PLATE CURRENT GRID CURRENT PLATE DUSSPATION	Typical Operation at frequencies up to 50 Mc:	Grid Voltage	Plate Current Grid Current (Approx.).	Driving Power (Approx.) Power Output (Approx.)

Approximately 2.5 watts power output can be obtained when the 6C4 is used at 150 megacycles as
an oscillator with grid resistor of 10,000 ohms and with maximum rated input.

MEDIUM-MU TRIODE



tubes. Outlines 3 and 24, respectively, OUT-LINES SECTION. Tubes require octal socket. Heater volts (ac/dc), 6.3; amperes, 0.3. Typical operation as class Aj amplifier: plate volts, 250 (300 max); grid volts, -8 (0 max); amplification factor, 20; plate resistance, 10000 ohms; trans-Metal type 6C5 and glass octal type 6C5-GT used as audio amplifier, oscillator, or detector

6C5 6C5

conductance, 2000 μ mhos; plate ma., 8; plate distinct watts. Type 6C5-GT is a DISCONTINUED type listed for reference only. Type 6C5 is used principally for renewal purposes.

SHARP-CUTOFF PENTODE



MEDIUM-MU TRIODE TWIN DIODE-

PD2 @ GIT

plifier, and ave tube. Outline 24B, OUTLINES SECTION. Heater volts (ac/dc), 6.3; amperes, 0.3. This type is similar to, but not interchangeable with, type 85. The 6C7 is a DISCON-Glass type used as combined detector, am-TINUED type listed for reference only.

MEDIUM-MU TWIN TRIODE

and phase inverter in radio equipment. Outline 23, OUTLINES SECTION. Tube requires octal socket. Heater volts (ac/dc), 6.3; amperes, volts, 250; grid volts, -4.5; plate ma., 3.2; plate Glass octal type used as a voltage amplifier 0.3. Maximum ratings for each triode unit as class A1 amplifier: plate volts, 250 max; grid pation, 1.0 max watt. Typical operation: plate volts, positive-bias value, 0 max; plate dissi-

resistance, 22500 ohms; amplification factor, 36; transconductance, 1600 µmhos. This type is used principally for renewal purposes.

STRODE SHARP-CUTOFF DUAL TETRODE

r E

plifier and autodyne mixer tube. Outline 8B, OUTLINES SECTION, except center pin is added to base. Tube Miniature type used as vhf rf-amrequires miniature ten-contact socket

@8<u>,</u> ୍ର P.T.R.

Related type: 609

and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.4. CENTER PIN

42CM-6378T

PLATE VOLTS

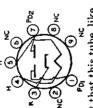
CLASS A. AMPLIFIER (Each Unit)

Aaximum Ratings, (Design-Maximum Values):

PLATE VOLTAGE	250 max	volts
PRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE.	180 max	volts
RID-No.2 Voltage.	See curve	page 70
	20 max	am.
PLATE DISSIPATION:		
Either plate	1.5 max	watts
Both plates (both units operating)	2.5 max	watts
GRID-No.2 Input:		
For grid-No.2 voltages up to 90 volts.	0.6 max	watt
For grid-No.2 voltages between 90 and 180 volts	See curve page 70	page 70
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	100 max	volts
	100 max	volts
	125	volts
Take Volcake	80	volts
Indiate to the second of the s	٦	volt
Plate Registance (Annual)	0.1	megohm
Tenencial of the second	8000	soum
Date Current	10	ma
	1.5	ma
Grid-No.1 Voltage (Approx.) for plate current of 20 µm.	ဗ္	volta

FULL-WAVE VACUUM RECTIFIER

Miniature type used in powerline 8E, OUTLINES SECTION. Tube supply of compact, audio equipment having moderate derequirements. Outrequires miniature nine-contact socket



and may be mounted in any position. It is especially important that this tube, like other power-handling tubes, be adequately ventilated. Heater volts (ac/dc), 6.3; amperes, 1.

FULL-WAVE RECTIFIER

1000 max	450 max	350 max
Maximum Ratings, (Design-Center Values):	PEAK INVERSE FLAIE VOLINGE	AC PLATESUPPLY VOLTAGE (Per Plate, rms) with Capacitor Input to Filter

volts volta EE

		•				
ER						L
SFILT			A C			
OPERATION CHARACTERISTICS FULL-WAVE CIRCUIT, CAPACITOR INPUT, TO FILTER	L		PEDA			
TER!		* *	≛ 5-	DHMS 150 200 240		
RAC	- 25	04 E	300	OHMS 150 200 240		
3 2	2	(S.)	Á	- S		Γ
20N		ENCY (7	3		Γ
ERA)	TYPE 6CA4 E4=4.3 VOLTS	SUPPLY FREQUENCY (CPS)= 60 CAPACITOR INPUT TO FILTER: 50/4*	FECT	¥.		T
o ¥	- Š	PLYF	7	PER PLATE		T
1	┝┋	3 3	TOTAL EFFECTIVE PLATE-SUPPLY IMPEDANCE			T
		1	-1-		<u> </u>	8
					¥3.	LTIJ

			İ		٦
EDANCE			1	_	- 82 - 82
TYPE 6CA4 E = 6.3 VOLTS SUPPLY FREQUENCY (CP3)= 60 CARACITON INPUT OF FILTER 150 MF TOTAL EFFECTIVE PLATE - SUPPLY IMPEDANCE PER PLATE - COMMAN AND POD 260		- 4	44		081
TYPE 6CA4 E4=6.3 VOLTS SUPPLY FREQUENCY (CP3)=40 CAPACITOR INDUT TO FILTE:50 D4 TOTAL EFFECTIVE PLATE:50 PPPLY PER PLATE:50445 A B C					8
A4 E4= REQUENCY RELIVE FECTIVE	<u> </u>	<u> </u>	H		
TYPE 6CA4 SUPPLY FREGUI CAPACITOR INF		\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	3		- 8
	1	\$ \$ \\ \[\]	/ 	ğ	୷

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500 max 500 600 700 50 50 50 150 200 240 245 293 347	DC OUTPUT CURRENT HOT SWITCHING TRANSIENT PLATE CURRENT (Per Plate)		. :	150 max #	ma.
500 600 700 50 50 50 150 200 240 245 293 347	Frak Heater-Cathons voltage: Heater negative with respect to cathode		:	500 max	volts
500 600 700 50 50 50 150 200 240 245 293 347	Typical Operation with Capacitor Input to Filter:				
50 50 50 150 200 240 245 293 347		_	•	200	volts
150 200 240 245 293 347	Filter-Input Capacitor 50	<u>ت</u> ة	0	20	ţ
245 293 347	,		<u> </u>	240	ohms
			e÷	347	volts

BEAM POWER TUBE

When capacitor-input circuits are used, a maximum peak current value per plate of 1 ampere during the initial cycles of the hot-switching transient should not be exceeded.



SECTION. Tube requires miniature erated in any position. Heater volts (ac/dc), 6.3; amperes, 1.2. Miniature type used in af power output stage of radio and television receivers. Outline 7C, OUTLINES seven-contact socket and may be op-

Related types: 12CA5, 25CA5

CLASS A1 AMPLIFIER

Maximum Ratings, (Design-Center Values):		
PLATE VOLTAGE	130 max	volts
Con. No 9 (scopper, Corn.) Vor race	120 2007	volte.
Control Manual Control View of the Control of the C	2011	410.
ORID-INGIL (CONTROL-GRID) VOLIAGE, FOSICIVE-DIAS VALUE	7 mm 0	ADIOA
PLATE DISSIPATION.	TOW C	Watts
GRID-NO.2 INPUT	1.4 max	watts
FEAR HEATER-CATHODE VOLTAGE:	;	
Heater negative with respect to cathode	200 max	volts
Heater positive with respect to cathode	200° max	volts
BULB TEMPERATURE (At hottest point)	180 max	ပ္
Typical Operation:		
	195	wolfe
Figure Voltage:	207	5 TO 1
	27	ADICS
Grid-No.1 (Control-Grid) Voltage	ا ا	volts
	4 .5	volts
	37	ma
	36	ma
	7	EE
	11	ma
	15000	ohms
	9200	empos.
Load Resistance	4500	em c
Distortion		ner cent
Maximum-Signal Power Output	1.5	watte
Maximum Circuit Values		
O. d. No 1. Circuit Besistance.		
For fixed-bias operation	0.1 max	mezohm
	0.5 max	megohm
o The de component must not exceed 100 volts.		

BEAM POWER TUBE

Glass octal types used as horizontal deflection amplifiers in color television receivers. Type 6CB5-A, Outline 25A, OUTLINES SECTION. Type 6CB5 maximum dimensions:

6CB5A **6CB5**

Tubes require octal socket and may be mounted in any position. Type 6CB5 is a over-all length, 5-1/8 inches; seated height, 4-19/32 inches; diameter, 2-1/16 inches. DISCONTINUED type listed for reference only.

volts amperes	ជីជីជី	203
8.3 5.5	0.4 22 10	
Heater Voltage (ac/dc) Heater Current	DIRECT INTERRELECTRODE CAPACITANCES (Approx.): Grid No.1 to Plate Grid No.1, to Cathode, Heater, Grid No.2, and Grid No.3. Plate to Cathode, Heater, Grid No.2. and Grid No.3.	

NRCONDUCTANCE* 8800 -Factor, Grid No.2 to Grid No.1* 3.8	Ē
r plate and grid-No.2 volts, 175; grid-No.1 volts,30; plate ma., 90; grid-No.2 ma., 6.	

HORIZONTAL DEFLECTION AMPLIFIER

	6CB5	6CB5-A	
	Design-Center	Design-Maximum	
aximum Ratinas:	Values	Values	
C PLATE VOLTAGE	700 max	880 max	volts
AK POSITIVE-PULSE PLATE VOLTAGE!	$6800^{\circ}max$	6800 max	Volts
AK NEGATIVE-PULSE PLATE VOLTAGE.	-1500 max	-1650 max	volts
C GRID-NO.2 (SCREEN-GRID) VOLTAGE	200 max	220 max	volts
C GRID-NO.1 (CONTROL-GRID) VOLTAGE	-50 max	-55 max	volts
LAK NEGATIVE-PULSE GRID-NO.1 VOLTAGE	-200 тах	-220 max	voits
PAK CATHODE CURRENT	- max	850 max	811
PERAGE CATHODE CURRENT	200 max	240 max	ma
RID-No.2 INPUT	3.6 mar	4 max	Watts
ATE DISSIPATION!	23 max	26 max	Watts
SAK HEATER-CATHODE VOLTAGE:		1	
Heater negative with respect to cathode	200 max	200 max	volts
Heater positive with respect to cathode	200 max	200 max	volts
JLB TEMPERATURE (At hottest point)	210 max	220 max	ပ္

id-No.1-Circuit Resistance..... aximum Circuit Value:

except as noted.

ILB.

megohm

0.47 max

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 5-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

10solute-Maximum Value. Under no circumstances should this absolute value be exceeded.

In adequate bias resistor or other means is required to protect the tube in the absence of excitation.

The dc component must not exceed 100 volts.





ature very high transconductance combined with low interelectrode capacitance megacycles per second and as rf amplifier in vhf television tuners. Tubes

alues, and are provided with separate base pins for grid No.3 and the cathode to ivers employing series-connected heater strings. Outline 7B, OUTLINES SEC-ION. Tubes require miniature seven-contact socket and may be mounted in any ermit the use of an unbypassed cathode resistor to minimize the effects of regeneraon. Type 6CB6-A has a controlled heater warm-up time for use in television reosition. For typical operation as a resistance-coupled amplifier, refer to RESIST-NCE-COUPLED AMPLIFIER SECTION.

EATER VOLUS (AC/DC)			5
BATER CURRENT		ල ල	amp
EATER WARM-UP TIME (A Verage) for 6CB6-A.		11	seco
	Without	With	
THE STATE OF THE S	External	External	
IRECT INTERELECTRODE CAPACITANCES:	Shield	Shield*	
	0.025 max	0.015 max	
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3,			
and Internal Shield	æ.	6.5	
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	61	ော	
With external shield connected to exthode.			

	330 max volts 0 max volts	See curve page 10 330 max volts 0 max volts	2.3 max watts 0.55 max watt	e par	200 max volts 200°max volts
CLASS A $_1$ AMPLIFIER Noximum $Values$):	LATE VOLTAGE. RID-NO.3 (SUPPRESSOR-GRID) VOLTAGE, Positive value.	RID-NO.Z (SKREM-GRID) VOLTAGE. RID-NO.Z SUPPLY VOLTAGE. RID-NO.Z (CONTROL-GRID) VOLTAGE. POSITIVE-bias value.	LATE DISSIPATION. INDIVIDING THEUT: FOR STAIN & VOLTAGES ID TO 155 VOLES	For grid-No.2 voltages between 165 and 330 volts. EAR HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode. Heater positive with respect to cathode.

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= Technical Data

Plate Supply Voltage voltage Voltage Cand No.3	25 volts	56 ohms	28 megohm		. 5 volts		-3 volts	13 ma	.7 ma	
7	-	~*	0	8000	۴		٠	_	œ	
Plate Supply Voltage Grid No.3	Grid-No.2 Supply Voltage	:	Plate Resistance (Approx.)	:	Grid-No.1 Voltage (Approx.) for plate current of 20 µa.			:	:	
	:	:	:	Transconductance.	:	83	resistor of 0 ohms	Plate Current	Grid-No.2 Current.	
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^o The dc component must not exceed 100 volts.

ics								•								
AVERAGE CHARACTERISTICS					VOLTS EC,=0		-0.5		T	_		Ņ	 -2.4 	-3	7:	300 350 400
AVERAGE	.3 VOLTS .2 VOLTS .L SHIELD	IODE AT SOCKE			CRID-NEI VOLTS							TC2 ECI=0				200 250 30
	TYPE 6CB6-A E4=6.3 VOLTS GRID NAS AND INTERNAL SHIELD	CONNECTED TO CATHODE AT SOCKET.			,					 					-	2 051 001
	٠;	CAID-N	Š Š	TIM (ics	:2 (:	2 20		9 1	£:	2 2) 31	*;	<u>t</u>		08

BEAM POWER TUBE

tal deflection amplifiers in high-efficiency deflection circuits of television receivers employing either transformer Glass octal types used as horizoncoupling or direct coupling to the de-

6CD6GA 990)9 Related type: 25CD6GB

92CM-9854TI

flection yoke. Type 6CD6-GA, Outline 25A, OUTLINES SECTION. Tubes require octal socket. Type 6CD6-GA may be supplied with pins 1, 4, and 6 omitted. Vertical tube mounting is preferred but horizontal operation is permissible if pins No.2 and 7 are in vertical plane. Type 6CD6-G has a maximum peak positivepulse plate-voltage rating (Absolute Maximum) of 6600 volts, a maximum platedissipation rating of 15 watts, and a maximum bulb-temperature rating (at hottest point) of 210°C. Type 6CD6-G is a DISCONTINUED type listed for reference only.

rolts pere

ъ ц ā

volts amperes	pf pf pf umhos ohms	
& 64 62 70	22 8 5 7700 7200	2 ma., 5.5.
HEATER VOLTAGE (AG/DC). DIRECAR CONTRACTOR (CONTRACTOR CONTRACTOR	United United Bartonia Conditions (Approx.): Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3 Flate to Cathode, Heater, Grid No.2, and Grid No.3 Thansponductance, Heater, Grid No.2, and Grid No.8 Thansponductance (Approx.) Mu-Farron. Grid No.2 to Grid No.1°	"For plate and grid-No.2 volts, 175; grid-No.1 volts, -30; plate ma., 75; grid-No.2 ma., 5.5.

Por operation in a 525-line. 30-frame system HORIZONTAL DEFLECTION AMPLIFIER

volts volts volts m a B 202 1500 max -200 max 700 max 200 max Peak Cathode Current. Average Cathode Current.

20 20	9	700	200	200	ž
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••		č	ă è	4	ĭ
			-		U.B. TEMPERATURE (At hottest point)
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CATE DISSIPATION	RID-No.2 INPUT.	BAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode	Heater positive with respect to cathode	4
4	æ	á	_		5

volts ampere seconds

ā p p

0.03 max

HEATER CURREAT HEATER WARLUT TIME (Average)
FIGATER WARLUT TIME (Average)
Grid No.1 to Plate
Grid No.1 to Plate
Grid No.1 to Statode, Heater, Grid No.2,
Grid No.3, and Internal Shield.
Plate to Cathode, Heater, Grid No.2,
Grid No.3, and Internal Shield.

HEATER VOLTS (AC/DC)...

watts watts volts volts C

222

= Technical Data =

1.9 20

Aaximum Circuit Value:

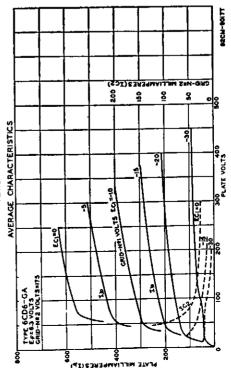
0.47 max For grid-resistor-bias operation Prid-No.1-Circuit Resistance:

megohm

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds. Under no circumstances should this absolute value be exceeded.

An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

BECH-BOILT S & S LIAMPERES(IC2) 2 AVERAGE CHARACTERISTICS PLATE VOLTS 읾 CAID-NOZ VOLTS ECZ =100 Ñ 8 The de component must not exceed 100 volts. EC2=173 TYPE 6CD6-GA E e=6.3 YOLTS GRID-N#1 YOLTS=0



SHARP-CUTOFF PENTODE

Miniature type used as rf and if employing series-connected heater amplifier in vhf television receivers strings. Outline 7B, OUTLINES SEC-TION. Tube requires miniature sevencontact socket and may be operated in any position.

Related type: 3CES





MEDIUM-MU TWIN TRIODE

volts

12 5 3 7

Miniature type used as combined vertical deflection and horizontal deflection oscillator in television receivers. Also used as phase inverter, sync separator and amplifier, and re-

Related type:

warm-up time for use in receivers employing series-connected heater strings. Except OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. For typical operation as a resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER SECTION. sistance-coupled amplifier in radio receivers. This type has a controlled heater for the common heater, each triode unit is independent of the other. Outline 8D,

Heater Voltage (ac/dc). Heater Current

207

volts

ampere

SHARP-CUTOFF PENTODE

Plate Current. Grid-No.2 Current.

Fransconductance Grid-No.1 Voltage (Approx.) for plate current of 35 µs. Grid-No.1 Supply Voltage Grid-No.1 Resistor (Bypassed) Plate Resistance (Approx.).....

megohm megohm pmhos volts ma

7600 7500 11 2.3

rolts rolts volt

watt

volts volts

200 max 200 max

Heater negative with respect to cathode. Heater positive with respect to cathode.

The dc component must not exceed 100 voits.

Grid-No.2 Voltage

Characteristics: Plate Voltage

volts volts volts

300 max 150 max 0 max 0.5 max 2 max

Plate Voldage. Grid-No.2 (screen-grid) Voltage. Grid-No.1 (control-grid) Voltage, Positive-biss value.

GRID-NO.1 (CONTROL-GRID) VOLTAGE GRID-NO.2 INPUT PLATE DISSIPATION PEAK HEATER-CATHODE VOLTAGE

Maximum.Ratings, (Design-Center Values):

CLASS A: AMPLIFIER

Miniature type used in television amplifier at frequencies up to about 45 megacycles per second and as an rf receivers as an intermediate-frequency

cause of its plate-current cutoff characteristic, this type is used in gain-controlled amplifier in vhf television tuners. Be-

stages of video if amplifiers. This type is electrically similar to miniature type 6CB6. Outline 7B, OUTLINES SECTION. Heater volts (ac/dc), 6.3; amperes, 0.3.

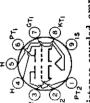
Characteristics:

Chafforennas.
Chafforennas.
Chafforennas.
Grid No.3.
Grid No.3.
Chafforen No.2.
Supply Voltage.
Cathode-Biss Resistor
Bise Resistore (Approx.)
Transconductance.
Transconducta

Transconductance. (Approx.) for plate current of 20 µa. Grid-No. 1 Voltage (Approx.) for plate current of 2.2 ma and cathode-bias resistor of 0 ohms.

Plate Current. Grid No.2 Current

Related type: J P



П

A Unit)	
(Each	
AMPLIFIER	1168);
₹	Val
CLASS At 1	(Design-Maximum
	Ratings,
	Maximum

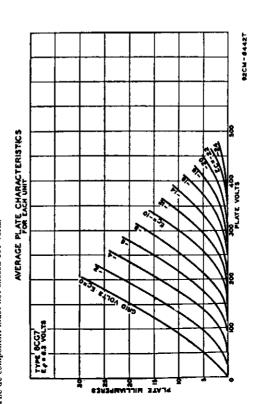
330 max volts 0 max volts	4 max watts 5.7 max watts 22 max ma	200 max volts
ive-bias value.	operating	reak itsates-carbone vortage: Heater negative with respect to cathode

200 max 250 260 2600 2600 1.3 90 80 80 80 80 10 10 Heater positive with respect to cathode..... Grid Voltage Amplication Factor Than Section (Approx.) Transconductance Grid Voltage (Approx.) for plate current of 10 µa. Plate Current for grid voltage of -12.5 volts. Plate Voltage. Plate Current..... Characteristics:

ohms mhos volts

1.0 max The de component must not exceed 100 volts. Grid-Circuit Resistance: For fixed-bias operation...... Maximum Circuit Value:

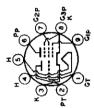
megohm



			volts	volts	ma	1118		watts	Watts		volts	volts
	Horizonial	Oscillator	330 max	-660 max	330 max	22 max		4 max	5.7 max		200 max	200 max
rame system	Vertical	Oscillator	330 max	-440 max	77 max	22 max		4 max	5.7 max		200 max	200 max
For operation in a 525-line, 30-frame system		Maximum Ratings, (Design-Maximum Values, Bach Unil):	DC PLATE VOLTAGE	PEAK NEGATIVE-PULSE GRID VOLTAGE	PEAK CATHODE CURRENT	AVERAGE CATRODE CURRENT	PLATE DISSIPATION:	For either plate.	For both plates with both units operating	PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode	Heater positive with respect to cathode

OSCILLATOR

= Technical Data ==



SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE ...

Miniature types used as combined oscillator and mixer tubes in television receivers utilizing an intermediate fre-

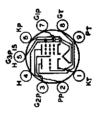
6CG8A 6CG8

> quency in the order of 40 megacycles per second. When used in an AM/FM

the pentode unit is used as a high-gain pentode mixer; in the FM section, the acteristics, and typical operating values are the same as those of miniature type pending on signal-to-noise considerations. Type 6CG8-A has a controlled heater warm-up time for use in television receivers employing series-connected heater 0.45; warm-up time (average) for 6CG8-A, 11 seconds. Maximum ratings, char-6X8. For curves of average characteristics, see type 6X8. The 6CG8 is a DISCONpentode unit is used either as a pentode mixer or as a triode-connected mixer destrings. Outline 8B, OUTLINES SECTION. Tubes require miniature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, receiver, the triode unit is used as an oscillator for both sections. In the AM section, TINUED type listed for reference only.

	Without	With	
Direct Interelectrode Capacitances: Triode Unit:	External Shield	External Shield	
Grid to Plate	1.5	1.5	70
Grid to Cathode, Heater, and Pentode Grid No. 3	ଷ	4	ž
Plate to Cathode, Heater, and Pentode Grid No. 3	0.0	-	, E
Pentode Unit:		1	
Grid No.1 to Plate	0.04 max	0 02 max	č
Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3	9	4	i
Plate to Cathode, Heater, Grid No.2, and Grid No.3.	6.0	· ·	1,7
Pentode Grid No.1 to Triode Plate	0.05 max	0 04 max	42
Pentode Plate to Triode Plate.	0.05 max	0.008 max	č
Heater to Cathode	6.5	6.5	, 1
 With external shield connected to cathode, except as noted. 			

· With external shield connected to plate.



SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE ...

Miniature type used in a wide variety of applications in television receivers. The pentode unit is used as an if amplifier, video amplifier, age amplifier, or reactance tube. The triode

unit is used in low-frequency oscillator, sync-separator, sync-clipper, and phase-splitter circuits. Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. For curves of average plate characteristics, refer to type 6AN8. The pentode-unit curve for the 6AN8 applies for this type except that grid No.3, heater, and internal shield (pin 5) are connected to ground.

volts ampere	###	22222
6.3	1.6 1.9 1.6	0,025 2,25 0,005 0,02 0,04
HEATER VOLTAGE (AC/DC). HEATER CURRENT. TO THE TELECTRODE CAPACITANCES:	Grid to Plate. Grid to Cathode, Heater, Pentode Grid No.3, and Internal Shield Plate to Cathode, Heater, Pentode Grid No.3, and Internal Shield	Ferrode Onto Plate Grid No.1 to Plate Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield Tricke Grid to Pentode Plate Pentode Grid No.1 to Tricke Plate Pentode Grid No.1 to Tricke Plate

The de component must not exceed 100 volts.

Maximum Circuit Value: Grid-Circuit Resistance.

megohma

2.2 max

2.2 max

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Center Values):	Triode Unit	Pentode Unit	
PLATE VOLTAGE.	300 max	300 max	2 5
GRID-NO.2 SUPPLY VOLTAGE	I	300 max	2
GRID-NO.2 (SCREEN-GRID) VOLTAGE.	ı	See curve page	page
GRID-No.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	0 max	0 max	>
PLATE DISSIPATION	z.o max	z max	75 ≩
For grid-No.2 voltages up to 150 volts	ı	0.5 max	B
For grid-No 2 voltages between 150 and 300 volts	1	See curve page	page
PEAK HEATER-CATHODE VOLTAGE: Hostor normities with respect to cathode	200 mar	* max	×
Heater positive with respect to cathode	200°max	0 max	7
Characteristics:			
Plate Supply Voltage	200	200	ž
Circ No.	-Connec	-Connected to ground at soc	tsoc
Grid-No.2 Supply Voltage.	1	150	š
Grid Voltage	9	1 5	5
Cathode-Bias Resistor	! 5	180	5
Amplification Factor	5750	300000	qo
Transconductance		6200	r i
Grid-No.1 Voltage (Approx.) for plate current of 10µa	£1-	œ.	Š
Plate Current	51	n e o	
Grid-No.2 Current.	í	9	

250 volts
150 cathode at socket
150 volts
-3 volts
3 volts
31 ma
7.2 ma

Plate Voltage
Grid No.8 and Internal Shield
Grid No.8 and Internal Shield
Grid No.2 Voltage
Grid No.1 Voltage
Grid No.1 Voltage
Ester Signal Plate Current
Zero-Signal Brate Current
Zero-Signal Grid Current
Zero-Signal Grid Current
Expensignal Grid Current
Zero-Signal Grid Out Current
Expensignal Grid Out Current
Expensignal Grid Out Current
Expensignal Grid Out Current
Flate Resistance (Approx.)

olts hms hms

retter Ette

max max.

GRID-NO.1 (CONTAGE:
CRID-NO.1 (CONTROL-GRID) VOLTAGE:
Negrative-bias value
Positive-bias value
PLATE DISSIVATION
PLATE CALINUT
PRAK HEATER-CATTORE VOLTAGE:
Heater negative with respect to cathode
Heater positive with respect to cathode
Heater positive with respect to cathode

olts olts olts olts atts

vatt e 70 olts olts

ypical Operation: Plate Voltage.

-50

0 max 300 max 150 max

Grid-No.3 (suppressor-grid) Voltage, Positive Value. Grid-No.2 (screen-grid) Supply Voltage. Grid-No.2 Voltage.

= Technical Data

volta Cott

100 max 100 max 200 max

whos per cent

0.09 11000 7500

ohme megohm

Transconductance Grid-No.1 Voltage (Approx.) for plate current of 10 µa. Load Resistance Total Harmonic Distortion Maximum-Signal Power Output.

Typical Operation in 4-Mc-Bandwidth Video Amplifier:

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:*

For fixed-bias operation....

megohm megohm

0.25 max 1.0 max

• The dc component must not exceed 100 volts.
• The heater-cathode voltage should not exceed the value of the operating cathode bias because the voltage between the heater and cathode is also applied between the cathode and grid No.3. The net result is to make grid No.3 negative with respect to cathode with possible change in tube characteristics. * If either unit is operating at maximum rated conditions, grid No.1-circuit resistance for both units should not exceed the stated values.

LOW-MU TRIODE

megohm megohm

0.1 max 0.5 max

For fixed-bias operation.

Circuit Resistance:

Grid-No.1

Maximum Circuit Values:

AVERAGE CHARACTERISTICS

CF = 6.3 VOLTS
GRD NP3 AND INTERNAL SHIELD
CONNECTED TO CATHODE AT

ş

SOCKET. GRID-N#2 VOLTS=190

ס ס ס אורו פאום-אבּו(זכּוּ) אורו

?

CRID-NA VOLTS ECIED

PLATE (1_b) OR GRID-H#2 (1C₂) MILLIAMPERES

volts volts volts ohms megohm ohms

24000 0.1 3900

Plate Supply Voltage.
Grid No.2 But Internal Shield.
Grid No.2 Supply Voltage.
Grid-No.1 Blass Voltage.
Grid-No.1 Signal Voltage (Peak to Peak)
Grid-No.2 Resistor
Grid-No.2 Resistor
Grid-No.1 Resistor
Grid-No.1 Resistor

Load Kesistor Zero-Signal Piate Current. Zero-Signal Grid-No.2 Current. Voltage Output (Peak to Peak)

volts at socket

300

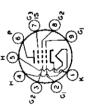
plification factor, 6.6; plate resistance (approx.), 1200 ohms; transconductance, 5500 µmhos. Maximum ratings as vertical deflection amplition-amplifier tube in television receivers. Out-line 14E, OUTLINES SECTION. Tube requires 1.25. Characteristics as class A₁ amplifier: plate Glass octal type used as a vertical-deflecoctal socket. Heater volts (ac/dc), 6.3; amperes, volts, 250; grid volts, -28; plate ma., 40; am-



fier (for operation in a 525-line, 30-frame system): de plate volts, 550 max; peak positive-pulse plate volta, 2000 max; peak negative-pulse grid volts, 250 max; peak cathode ma., 350 max; average cathode ma., 100 mar; plate dissipation, 12 max watts; peak heater-cathode volts, 200 max (the de component must not exceed 100 volts). This type is used principally for renewal purposes.

POWER PENTODE

Miniature type used in output stage of video amplifier of television receivers and as wide-band amplifier tube in industrial and laboratory equipment. Outline 8D, OUTLINES SEĆ-



TION, Tube requires miniature nine-contact socket and may be mo positicn.

HEATER VOLTAGE (AC/DC)
HEATER CURRENT
DIRECT INTERELECTRODE CAPACITANCES (Approx.):
Grid No.1 to Plate
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield

the same of the sa	Maximum Ratings, (Design-Center Values):	PLATE VOLTAGE
	Maximum Ratings	PLATE VOLTAGE.

210

	A	25.5	n n n
	ed in any	volts ampere	
	mounted	6.3	0.12 11 5.5

SHARP-CUTOFF TETRODE MEDIUM-MU TRIODE-

8729

92CM-780271

300 ATE VOLTS

8

7

heater strings. Outline 8B, OUTLINES SECTION. Tubes require miniature Miniature types used as combined whf oscillator and mixer in television receivers employing series-connected

6CL8A Related lypes: SCLBA, 19CLBA

211

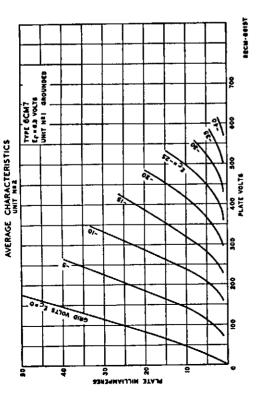
WOKTR IS © RTIO

volts

300 max

2.5 max megohms Fig. The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds. 2.2 max 2.2 max For cathode-bias operation For grid-resistor-bias operation

* The dc component must not exceed 100 volts.



SHARP-CUTOFF PENTODE HIGH-MU TRIODE-

₹g. Sp.

pentode unit is used as an intermediplifier, an age-amplifier, or as a reactapplications in television receivers. The ate-frequency-amplifier, a video-am-Miniature type used in variety of

> **6CM8** Related type: SCA

ance tube. The triode unit is used in sweep-oscillator, sync-separator, sync-clipper, and phase-splitter circuits. Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.45; warm-up time (average), 11 seconds.

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Center Values):	Triode Unit	Triode Unit Pentode Unit 300 max	volts
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE.	ı	See curv	00 max volts
GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value. Dr and Discussion.	0 max 1 max	0 max 2 max	volta
GRID-NO.2 Invor. For grid-No.2 voltages up to 150 volts. For grid-No.2 voltages between 150 and 300 volts.	*11	0,5 max See curv), 5 max watt See curve page 70
PEAK HEATER-CATHODB VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode.	200 max 200™max	200 max 200°max	volts
Choracteristics: Plate Supply Voltage Grid-No.2 Supply Voltage Grid-No.2 Supply Voltage Grid-No.2 Supply Voltage Grid-No.2 Supply Transconductance Grid-No.1 Voltage Grid-No.1 Voltage (Approx.) Plate Current. Grid-No.2 Current.	250 -2 -2 100 0.05 2000 1.8	250 150 180 180 6200 6200 7.5 2.8	volts volts volts ohms megohm µmhos volts ma

= Technical Data =

Grid-No.1-Circuit Resistance: Maximum Circuit Values:

megohms

For fixed-bias operation.

megohm megohm 0.25 max 1 max Triode Unit Pentode Unit 0.25 max

The dc component must not exceed 100 volts.

TWIN-DIODE—HIGH-MU TRIODE ⊛ <u>@</u>

Miniature type used as combined horizontal phase detector and reactance tube in television receivers employing series-connected heater strings.

6CN7 Related type: ŠČŽ

position. For typical operation of triode unit as resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER SECTION. For curve of average plate characteristics for triode unit, refer to type 6T8-A. Heater volts (ac/dc), 6.3 TION. Tube requires miniature nine-contact socket and may be mounted in any (series), 3.15 (parallel); amperes, 0.3 (series), 0.6 (parallel); warm-up time (aver-OUTLINES SECrator, sync-amplifier, or audio amplifier circuits. Outline 8B, The triode unit is used in sync-sepaage), 11 seconds.

TRIODE UNIT AS CLASS A, AMPLIHER

Maximum Ratings, (Design-Maximum Values):

volts	watt	volts volts
330 max 0 max	1.1 max	200 max 200 max
PLATE VOLTAGE, Positive-bias value.	PLATE DISSIPATION.	FEM HENTER-ARTHOLD VOLAGES Heater negative with respect to cathode Heater positive with respect to cathode

	volts	volts	ohms	#mhos	e Cu
	250	9 09	58000	1200	-
	100	1 6	54000	1300	æ. •
Characteristics:	Plate Voltage	Grid Voltage.	Amplineation Factor	Transconductance	Plate Current

DIODE UNITS

volta volta EU. 5.5 max 200 max 200 max PLATE CURRENT (Each Unit).
PLAK HEATER-CATHOON VOLTAGE
HEATER negative with respect to cathode.
Heater positive with respect to cathode. Maximum Ratings, (Design-Maximum Values):

HALF-WAVE VACUUM RECTIFIER

The dc component must not exceed 100 volts.

Octal type used as damper tube in horizontal-deflection circuits of television receivers. Outline 14F, OUT-LINESSECTION. Tuberequires octal

position. Socket terminals 1, 2, 4, and 6 should not be used as tie points. It is especially important that this tube, like other power-handling tubes, be adequately socket and may be mounted in any ventilated. Heater volts (ac/dc), 6.3; amperes, 1.6.

DAMPER SERVICE

For operation in a 525-line, 30-frame system Maximum Ratings, (Design-Maximum Values):

5500 max 1200 max 190 max 6.5 max 5500 max PEAK INVERSE PLATE CURRENT
PEAK PLATE CURRENT
DC PLATE CURRENT
PLATE DISSIPATION
PEATE CAREOF
PLATE CAR

volts ma ma watta

voits volta

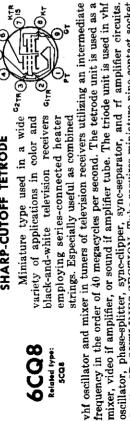
Characteristics, Instantaneous Value:

 The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.
 The dc component must not exceed 900 volts.
 The dc component must not exceed 100 volts. 35 Tube Voltage Drop for plate current of 250 ma

SHARP-CUTOFF TETRODE MEDIUM-MU TRIODE-

Related lype:

black-and-white television receivers $G_{178}^{(2)}$ variety of applications in color and employing series-connected heater strings. Especially useful as combined



volts Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position.

HEATER VOLTAGE (AC/DC)....

HEATER CURRENT			;
HEATER WARM-UP TIME (Average)	Without	With	5
	External	External	
Direct Interelectrode Capacitances:	Shield	Sureig	
Triode Unit:	•	œ.	
Grid to Plate	C.E	ie ie	
Grid to Cathode and Heater		- 0	
Plate to Cathode and Heater	4.0	4.	
Tetrode Unit:	970	0.015	
Grid No.1 to Plate	O OIS max	O. U.L.O. TREATS	
Grid No.1 to Cathode, Heater, Grid No.2 and Internal		2	
Shield	٠ د د) e	
Plate to Cathode, Heater, Grid No.2, and Internal Shield	0,10	5.50	
Tetrode Plate to Triode Plate	0.0% max	10.0	
Heater to Cathode (Each Unit)	9.0	[o.e	

are a ree

With external shield connected to cathode of unit under test.
 With external shield connected to ground.

CLASS A, AMPLIFIER		
Maximum Ratings, (Destan-Maximum Values):	Triode Unit	Tetrode Un
Prate Voltage	330 max	330 max
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE		Sec max
GRID-NO.2 VOLTAGE	1 4	0 most
Grid-No.1 (control-grid) Voltage, Positive-dias value	o d max	20 00 40 C
PLATE DISSIPATION	0. 1 max	0.1 mark

See curve page 70 rve page 70 x volts 200 max 200* max 0.7 max 200 max 0.55 жал GRID INPUT.
PRAK HBATER-CATIODE VOLTAGE.
Heater negative with respect to cathode.
Heater negative with respect to cathode. For grid-No.2 voltages up to 165 volts. For grid-No.2 voltages between 165 and 330 volts

Peak Heater-Cathode Voltage: Heater negative with respect to cathode Heater positive with respect to cathode	200 max 200* max	200 max 200* max	volts
Choracteristics: Plate-Supply Voltage. Grid-No.2 Supply Voltage. Cathode-Bias Resistor Cathode-Bias Resistor Amplification Factor Plate Resistance (Approx.) Transconductance (Approx.)	125 - - 56 40 5000 8000 15	125 125 -1 140000 5800 12	volts volts volts ohms mhos mhos ma
Flate Current. Grid-No.2 Current.	1	4.	aCE a
Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-bisa operation.	0.5 max 1.0 max	0.25 max 1.0 max	megohm megohm

= Technical Data

DIODE-REMOTE-CUTOFF PENTODE

The diode unit is used as an AM de-Miniature type used as combined detector and audio amplifier in automobile and ac-operated radio receivers.

tector, and the pentode unit as an

automatic-volume-controlled audio amplifier. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.3.

DENITORS INIT AS CLASS A AMBIRITO

PENTODE UNIT AS CLASS A, AMPLIFIER			
Maximum Ratings, (Design-Center Values):	900	aller	
FLATE VOLTAGE. GRID-NO.2 (SCREEN-GRID) VOLTAGE.	See curv	See curve page 70	
-No.2 Supply Voltage.	300 max	volts	
GRID-No.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	0 max	volts	
GRID-No.2 Input:			
For grid-No.2 voltages up to 150 volts.	See curv	.3 max watt See curve page 70	
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	100 max	volts volts	
Dealer positive with tespect to canonic,	204	3	
	950	volts	
Figure Voltage	200	volts	
No 1 Voltage	-5	volta	
Plate Registance (Approx.)	8.0	megohm	
Transconductance	2200	Bodm4	
Plate Current	9	ma	
Grid-No.2 Current	9 (EE:	
No.1 Voltage (Approx.) for transconductance of 10 µmhos	-32	Volta	
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance:	:	•	
For fixed-bias operation	0.25 max	megopu	
For cathode-bias operation	1.0 max	megopu	
DIODE CINIT			
Maximum Rafing, (Design-Center Value):	,		
PLATE CURBENT.	1 max	ma	
H.			

PENTAGRID AMPLIFIER

Miniature type used as a gated amplifier in television receivers. In bined sync separator and sync clipper. such service, it may be used as a com-Outline 7B, OUTLINES SECTION.

Related types: 3CS6, 4CS6 Tube requires miniature seven-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.3.

CLASS AL AMPLIFIER

Peak Heater negative with respect to cathode. Heater negative with respect to cathode.	200 max 200 max	
Maximum Circuit Values: Grid-No.1-Circuit Resistance Grid-No.3-Circuit Resistance -The dc component must not exceed 100 volts.	0.47 max 2.2 max	

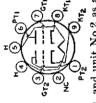
volts volts

megohm megohms

MEDIUM-MU DUAL TRIODE

Related type:

heater strings. Unit No.1 is used as a ceivers employing series-connected Miniature type used as combined vertical deflection oscillator and vertical deflection amplifier in television re-



conventional blocking oscillator in vertical deflection circuits, and unit No.2 as a miniature nine-contact socket and may be mounted in any position. Heater volts vertical deflection amplifier. Outline 8D, OUTLINES SECTION. Tube requires (ac/dc), 6.3; amperes, 0.6; warm-up time (average), 11 seconds.

CLASS A. AMPLIFIED

		volts	volts	ohme	*mhos	volts	VOIUS	ma
	Unit No. 2	250	-10.5	3450	4500	1 6	77-	300
CLASS AT AMILIER	Characteristics: Unit No. 1	Dista Valteen 250	Grid Voltage	Amplification Factor 7700	Flate Resistance (Approx.)	Grid Voltage (Approx.) for plate current of 10 µa24	Grid Voltage (Approx.) for plate current of 50 µa	Plate Current For grid voltage of -16 volts.

VERTICAL DEFLECTION OSCILLATOR AND AMPLIFIER For overation in a 525-line, 30-frame system

No. 2			. 5	05 max ma	6.5 max watts	200 max volts 200 max volts
Unit No. 1 Unit No. 2	4	500 max 500 max	-400 max	70 mar 20 mar	1.25 max	200 max 200 max
Unit No	Maximum Ratings, (Design-Center Values):	DC PLATE VOLTAGE	Peak Positive-Pulse Plate Voltagej (Aosour Matheum) Peak Negative-Pulse Grid Voltage	PEAK CATHODE CURRENT.	AVERAGE CATHODE CURRENT	Peak Heater-Cathode Voltage: Hater negative with respect to cathode.

Crite-Circuit Resistance.

1.2 max megohins
The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-lim, 30-france system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

1.4 Under no circumstances should this absolute value be exceeded.

1.5 The dc component must not exceed 100 volts.

Maximum Circuit Values:

BEAM POWER TUBE

12CU5/12C5, 17CU5 **6CU**5 Related types:

Miniature type used in the audio Tube requires miniature seven-contact socket and may be mounted in any output stage of television receivers. Outline 7C, OUTLINES SECTION. position.



HEATER VOLTAGE (AC/DC). HRATER (JURRENT	1.3 2.5	volts amperes
DIRECT INTERFILECTRODE CAPACITANCES (Approx.): Grid No.1 to Plate, Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3. Plate to Cathode, Heater, Grid No.2, and Grid No.3.	0.6 13 8.5	pî pî
CLASS A. AMPLIFIER		

Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE
Design-M	
Ratings,	LTAGE
Maximum	PLATE VO

volts

150 max



109	MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE Miniature type used in a wide variety of applications in color and black-and-white television receivers employing series-connected heater	
109 109	Refer to type 6896GTB/6CU6	
0.1 max 0.5 max	ximum Circuit Values: 1-No.1-Circuit Resistance: For fixed-bias operation. For cathode-bias operation.	Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation.
120 110 110 -8 -8 50 50 10000 7500 2500 2500 2500 2500 2500 2500	■ The dc component must not exceed 100 volts. Typical Operation: Plate Voltage Grid-No.2 Voltage Grid-No.1 Voltage Grid-No.1 Voltage Grid-No.1 Voltage Grid-No.1 Voltage Zero-Signal Plate Current. Maximum-Signal Plate Current Maximum-Signal Grid-No.2 Current Maximum-Signal Grid-No.2 Current Transconductance (Approx.) Transconductance (Approx.) Total Harmonic Distortion Total Harmonic Distortion Maximum-Signal Power Output	The dc component must Typical Operation: Iypical Operation: Grid-No.2 Voltage Grid-No.1 Voltage Grid-No.1 Voltage Grid-No.1 Voltage Grid-No.1 Voltage Zero-Signal Plate Current. Zero-Signal Grid-No.2 Current. Maximum-Signal Grid-No.2 Current. Maximum-Signal Grid-No.2 Current. Tera Resistance (Approx.) Transconductance Transcondu
200 max 200 max 220 max	PEAR HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode. Heater positive with respect to cathode. BULB TEMPERATURE (At hottest point). The dc component must not exceed 100 volus.	PEAK HEATER-CATHODE VOLTAGE: Heaten regative with respect to cathode. Heater positive with respect to cathode. BULB TEMPERATURE (At hottest point). The dc component must not exceed 100 volts.
130 max 0 max 7 max	(RRIPNOS I SCREEN-GRUD) VOLTACE, POSICIVE-DISS VAIUE. PLATE DISSERATION	GRID-NO.2 (SCHEEN-URID) VOLIAGE. GRID-NO.1 (CONTROL-GRID) VOLIAGE. PLATE DISSIPATION.

volta
volta
volta
volta
volta
mas
mas
mas
ma
ohms
ohms
ohms
per cent

volts vatts watts volts volts

= Technical Data =

megohm megohm

9

if amplifier, a video amplifier, an age amplifier, and a reactance tube. The triode unit is used in low-frequency oscillator, sync-separator, sync-clipper, and phase-splitter circuits. Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. For curves of plate ∞ strings. The pentode unit is used as an characteristics for pentode unit, refer to type 6AN8. KT, 63 P (ૼ

volts ampere seconds	ጆጆጃ	p ja	a a a
6.3 0.45 11	1.9 1.9 1.6	0.025 max	2.4 0.03 max 0.07 max
Heater Voltage (ac/dc). Heater Voltage (ac/dc). Heater Warm-up Tine (Averge) Direct Interelectrode Capacitances:	Triode Unit: Grid to Plate Grid to Cathode, Heater, Pentode Grid No.3, and Internal Shield Plate to Cathode, Heater, Pentode Grid No.3, and Internal Shield	Pentode Unit Plate Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, Triode Cathode, and Internal Shield Plate to Cathode, Heater, Grid No.2, Grid No.3, Triode Cathode, and In-	ternal Shisid. Pentode Grid No.1 to Triode Plate Pentode Plate to Triode Plate

CLASS A, AMPLIFIER		
Maximum Ratings, (Design-Maximum Values):	Triode Unit	Triode Unit Pentode Unit
PLATE VOLTAGE	330 max	330 max
GRID-NO.2 SUPPLY VOLTAGE	,	330 max
GRID-NO.2 (BCREEN-GRID) VOLTAGE	1 -	See curve pa
GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	o max	0 2000
PLATE DISSIPATION	2. 8 max	2. o max
GRID-NO.2 INPUT:		2 2 2 2
For grid-No.2 voltages up to 165 volts	I	O. O. TRUES
For grid-No.2 voltages between 165 and 330 volts	ı	see carve pa
PEAK HEATER-CATHODE VOLTAGE:	900	2000
Heater negative with respect to cathode	200 11102	2000
Heater positive with respect to cathode	zon max	TOO MANY

volts volts volts watts

watt age 70 volts volts

Characteristics:	Plate Supply Voltage	.2 Supply Voltage	.1 Voltage	-Bias Resistor	ation Factor
	:		;		
	:	:	:	:	:
	:	:		;	:
	:	:	:	:	:
	:	:	:	:	:
	:	:	:	:	:
	:	:		:	
	-	:	:	:	:
		:	÷	:	:
	:	:	;	:	:
	:	:	:	:	:
	:	:	:	÷	:
		:	:	٠	

24 4100 5800 -19 Transconductance (Approx.) for plate current of 20 µ2. Grid-No.1 Voltage (Approx.) for plate current. Plate Current for grid-No.1 voltage of -8 volts and cathodebias cesistor of 0 ohms. Plate Resistance (Approx.).....

° The de component must not exceed 100 volts.

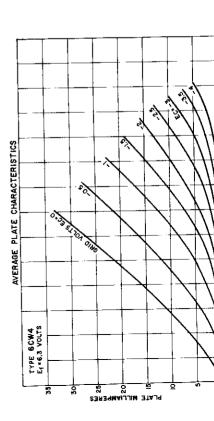
HIGH-MU TRIODE

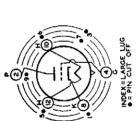
Related hypes: 2CW4, 13CW4 6CW4

Nuvistor type used as a groundedcathode, neutralized rf amplifier in vhf Tube requires nuvistor socket and may tuners of television and FM receivers. Outline 1, OUTLINES SECTION. be operated in any position.



55 max 0 max 1.5 max 15 max 100 max 100 max 300°max 135 max Negative-bias value Peak positive value PLATE DISSUPATION CATHORD CURRENON PEAR HATEN-CATHORD VOLTAGE Heater negative with respect to cathode Heater positive with respect to cathode PLATE SUPPLY VOLTAGE. PLATE VOLTAGE. CLASS A. AMPLIFIER Maximum Ratings, (Design-Maximum Values): GRID VOLTAGE:





A plate supply voltage of 300 volts may be used provided that a sufficiently large resistor is used in
the plate circuit to limit the plate dissipation to 1.6 watts under any condition of operation.
 For operation at metal-shell temperatures up to 135° C.

For fixed-bias operation For cathode-bias operation

Maximum Circuit Values: Grid-Circuit Resistance:

0.5 max 2.2 max

volts volts ohms ohms

= Technical Data

ohma µmhos volta ma

47000 68 5440 12500

. 5900 4.7

Transconductance Grid Voltage (Approx.) for plate current of 10 μα Plate Current.

Amplification Factor.
Plate Resistance (Approx.)

Grid Resistor.

volta volta volta ohma

Pentode Unit

Triode Unit

ohms µmhos volts 8

56 170000 7800 -8 12

Plate Supply Voltage Grid Supply Voltage Cathode-Bias Resistor

Characteristics and Typical Operation:

arator, sync-amplifier, and sync-clipper circuits. Outline 8D, OUTLINES SEC-

amplifier, sweep-oscillator, sync-sep-

Related type: BCX8

receiver applications. Pentode unit is Miniature type used in television used as video amplifier; triode unit is used in sound intermediate-frequency

SHARP-CUTOFF PENTODE

MEDIUM-MU TRIODE—

TION, Tube requires miniature nine-contact socket and may be mounted in any

CLASS A. AMPLIFIER

volts amp	10 10 10 10 10 10 10 10 10 10 10 10 10 1	
6.3 0.135	0.92 4.33 1.8 0.18 1.6	

position. Heater volts (ac/dc), 6.3; amperes, 0.75. Maximum Ratings, (Design-Maximum Values):

volts volts

volts volts watt

volta volta II.

PLATE VOLTAGE. GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE. GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE. GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-biss value. PLATE DISSIPATION. GRID-NO.2 INPUT: FOR grid-NO.2 voltages up to 165 volts. FOR grid-NO.2 voltages between 165 and 330 volts. FARTER-CATHODE VOLTAGE. FRATER-CATHODE VOLTAGE: Heater negative with respect to cathode.
--

For grid-No.2 voltages up to 165 volts. For grid-No.2 voltages between 165 and 330 volts.	ı	1.1 max See curve
Peak Heares-Carthon Volrace esthode Hearer negative with respect to cathode Hearer positive with respect to cathode	200 max 200°max	200 max 200 max
Characteristics		;

volts volts

curve page 70

1.1 max

See curve page 70 0 max volts 5 max watts

0 max 2 max

Pentode Unit

Triode Unit 330 max

330 max 330 max

Plate Supply Voltage	150	200
Grid-No.2 Supply Voltage	1 0 1	077
Cathode-Bias Resistor	100	9
Amplification Factor	100	20000
Plate Resistance (Approx.)	00.54	10000
Transconductance	000	2001
Grid-No.1 Voltage (Approx.) for plate current of 100 µa	p c	0.6
Plate Current	D.	, r
Grid-No.2 Current	I	1
Maximum Circuit Values:		

ohms µmhos volts ma

volts volts ohms

megohm megohm

0.25 max

0.5 max 1 max

The dc component must not exceed 100 voits.

For fixed-bias operation.... For cathode-bias operation.... Grid-No.1-Circuit Resistance:

	fier in Outlin Tube
, ©,	\$10 111 0) 1

HARP-CUTOFF TETRODE

Miniature type used as rf amplirequires miniature seven-contact socket and may be mounted in any whi tuners of television receivers. ne 7B, OUTLINES SECTION. position.

Related types: 2CY5, 3CY5, 4CY5 **6CY5**

22

220

92CM-10524TL

IEO PLATE VOLTS

CLASS A, AMPLIFIER

	80 max volts 80 max volts See curve page 70 0 max volts 20 max ma	.6 max watt See curve page 70 2 max watts	volts volts	volts volts volt megohm µmhos ma
	180 max 180 max See curv 0 max 20 max	0.6 max See curv 2 max	100 max 100 max	125 80 -1 0.1 8000 10 1.5 -6
Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE. GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE GRID-NO.2 VOLTAGE GRID-NO.1 (CONTROL GRID) VOLTAGE, POSITIVE-bias value CATHODE CURRENT.	GRID-NO.Z INPUT: For grid-No.2 voltages up to 90 volts. For grid-No.2 voltages between 90 and 180 volts. PLATE DISSIPATION	PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode.	Characteristics: Plate Voltage. Grid-No.2 Voltage. Grid-No.2 Voltage. Plate Resistance (Approx.) Transconductance. Transconductance. Grid-No.2 Current. Grid-No.2 Current. Grid-No.1 Voltage (Approx.) for plate current of 20 μ a.

0.5 max Grid-No.1-Circuit Resistance. Maximum Circuit Value:

92CH-9518T GRID-NEZ VOLTS + 80 240 Eg . 6.3 VOLTS TYPE 6CYS 5-2.0 'n Ec, 2-1.0 AVERAGE CHARACTERISTICS NET VOLTS PLATE VOLTS ~ PLATE (Ib) OR GRID - NE Z (ICZ) MITTIVMSEBEZ

DUAL TRIODE

Related type: **6CY7**

Miniature type used as combined flection amplifier in television receivers. Unit No.1 is a high-mu triode vertical oscillator and vertical deunit used as a blocking oscillator in

⊕ KT2

vertical deflection circuits, and unit No.2 is a low-mu triode unit used as a vertical deflection amplifier. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.75.

= Technical Data

CLASS A, AMPLIFIER				
Characteristics:	Unit No.1	Unit No.2		
Plate Supply Voltage	250	150	volts	
Indian Deliging	65	1	volts	
Cathode-Risa Registor	ı	620	ohms	
Amplification Pactor	89	'n		
Plate Resistance (Approx.)	52000	920	ohme	
Transconductance	1300	5400	mpos d	
Crid Voltage (Approx.) for plate current of 10 as.	5.5	1	VOITE	
Call Waters (Approx.) for plate current of 200 us.	1	9	volts	
Ulit Chinadat	7.5	30	ma	
Plate Current for grid voltage of -30 volts.		3,55	ma	
VERTICAL DEFLECTION OSCILLATOR AND AMPLIFIER	D AMPLIFIE	~		
For operation in a 525-line, 30-frame system	system			
	Unit No.1	Unit No.2		
Maximum Ratings, (Design-Maximum Vatues):	Oscillator	Amplifier		
DC Drags Voltages	850 vnax	850 max	volts	
DEAN DOCTOR PLATE VOLTAGE	I	1800 max	volts	
Date Necestary Prize Caro Voltage	-400 max	-250 max	volts	
Fran Ingalive Comment	1	190 2007	Ē	

Amplifier	850 vndx	. ISOU MEET	-400 max250 max	- 120 max	2021 00	I max b o max wates	000	200 max 200 max	Z00-max Z00-max	
Maximum Ratings, (Design-Maximum Values):	DC PLATE VOLTAGE	PEAK POSITIVE-PULSE PLATE VOLTAGE#	PEAR NEGATIVE-PULSE GRID VOLTAGE	PEAK CATHODE CURRENT	AVERAGE CATHODE CURRENT	PLATE DISSIPATION	PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode	Heater positive with respect to cathode	•

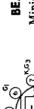
Maximum Circuit Values:

The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 538-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

The dc component must not exceed 100 volts. 2.2 max megohms 2.2 max Grid-Circuit Resistance......

For cathode-bias operation.

megohm



BEAM POWER TUBE

onal deflection angles of 110 degrees Miniature type used as a vertical deflection amplifier in high-efficiency deflection circuits of television receivers utilizing picture tubes having diag-

and operating at ultor voltages up to 18 kilovolts. Also used in the audio output stage of television and radio receivers. This type has a controlled heater warm-up OUTLINES SECTION. Tube requires miniature nine-contact socket and may be time for use in receivers employing series connected heater strings. Outline 8E, mounted in any position.

volts ampere seconds	pf pf pf megobm mhos	
6,3 11	0.4 max 9 6 0.073 4800	
Heater Voltage (AC/DC) Heater Current Heater Warm-UP Time (A verage)	DIRECT INTERELECTRODE CAPACITANCES: Grid No.1 to Plate. Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3 Flate to Cathode, Heater, Grid No.2, and Grid No.3 Flate Resistance (Approx.)* Thansconductance*	3 / 0 -1/4 (0 /1 - 1

* Plate and grid-No.2 volts, 250; grid-No.1 volts, -14; plate ma., 46; grid-No.2 ma., 4.6.

For operation in a 525-line, 30-frame system Maximum Ratings, (Design-Maximum Values):

VERTICAL DEFLECTION AMPLIFIER

şΣ	š š	44	> >
350 max 2200 max	315 max -275 max 155 max	45 max 10 max 2.2 max	200 max 200^max 250 max
DC PLATE VOLTAGE PEAR POSITIVE-PLASE PLATE VOLTAGE	GRID-NO.2 (SCREBN-GRID) VOLTAGE. PARK NEGRIVE-PULSE GRID-NO.1 (CONTROL-GRID) VOLTAGE. PRAK CATHODE CHREBYT.	AVERAGE CATHODE CURRENT PLATE DISSIPATION GRID-NO.2 INPUT	Peak Heater-Cathods Volaks: Heater negative with respect to cathode. Heater positive with respect to cathode. Bulb Temperature (At-hottest point).

oolts rolts rolts ma ma watts

ofta C

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:

For fixed-bias operation... For cathode-bias operation...

1.0 max megohm # The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 623-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

The de component must not exceed 100 volts.

megohm

SECTION. Tube requires six-contact socket, Except for interelectrode capacitances, this type is identical electrically with type 6U7-G. Refer to type 6SK7 for application information. Heater volts (ac/dc), 6.3; amperes, 0.3. This Glass type used in rf and if stages of radio receiversemploying avc. Outline 24A, OUTLINES type is used principally for renewal purposes. REMOTE-CUTOFF PENTODE

SHARP-CUTOFF PENTODE

Glass type used as detector or amplifier in radio receivers. Outline 24A, OUTLINES SEC-TION. Heater volts (ac/dc), 6.3; amperes, 0.3. For electrical characteristics, refer to type 6J7. Type 6D7 is a DISCONTINUED type listed for reference only.

6D7

PENTAGRID CONVERTER

capacitances and heater rating, the 6D8-G is similar electrically to type 6A8-G. Type 6D8-G is a DISCONTINUED type listed for reference Glass octal type used in superheterodyne 6.3; amperes, 0.15. Except for interelectrode Fube requires octal socket. Heater volts (ac/dc), circuits. Outline 23, OUTLINES SECTION

HALF-WAVE VACUUM RECTIFIER

Related type: 1704

tube in horizontal-deflection circuits of television receivers. Outline 14C, OUTLINES SECTION. Tube re-Glass octal type used as damper quires octal socket and may be mounted

in any position. May be supplied with pin No.1 omitted. Socket terminals 1, 2, 4, and 6 should not be used as tie points. It is important that this tube, like other power-handling tubes, be adequately ventilated. Heater volts (ac/dc), 6.3; amperes, 1.2.

DAMPER SERVICE

For operation in a 525-line, 30-frame system Maximum Ratings, (Design-Maximum Values):

4400 max	300 max	100 max	200	4400 - max	$300^{4}max$
PEAK INVERSE PLATE CURRENT	PEAK PLATE CURRENT.	PLATE DESIPATION.	PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode	neater positive with respect to cathode.

cycle. In a Heater positive wint respect to cathode.

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning 525-line, 30-frame system, 15 per cent of one horizontal reanning capelland.

BEAM POWER TUBE

volts

The dc component must not exceed 900 volts.

A The dc component must not exceed 100 volts.

Miniature type used as verticalreceivers. Outline 8D, OUTLINES SECTION, except all vertical dimendeflection-amplifier tube in television sions of this type are 1/8 inch greater.



= Technical Data =

Heater volts (ac/dc), 6.3; amperes, 1.2. Except for heater ratings, this type is iden-Tube requires miniature nine-contact socket and may be operated in any position. tical with miniature type 12DB5.

© &a

SHARP-CUTOFF PENTODE

Miniature type used in the gaincontrolled picture if stages of color television receivers. It is also used as a radio-frequency amplifier in the tuners

of such receivers. Outline 7B, OUT-

LINES SECTION. Tube requires seven-contact miniature socket and may be mounted in any position.

HEATER VOLTAGE (AC/DC)
HEATER CURRENT
DIRECT INTERELECTRODE CAPACITANGES:
Grid No.1 to Plate.
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.9, and Internal Shield
Plate to Cathode, Heater, Grid No.2, Grid No.9, and Internal Shield

volts ampere

8. 6. 8. 6.

ሽሽሽ

0.02 max 6.5

CLASS ALAMPLIFIER

Maximum Ratings, (Design-Center Values):

page 70 volts watts curve 0 max 2 max 808

5 max watt See curve page 70 200 max 200°max 0.5 max PLATE VOLTAGE

(SIRD-NO.2 SUPPRESSOR-CRID) VOLTAGE, Positive value

(BRID-NO.2 SUPPLY VOLTAGE,

(BRID-NO.2 SUPPLY VOLTAGE,

(BRID-NO.1 (CONTROL-GRID) VOLTAGE,

PLATE DISSIPATION.

FOR ETIGH-NO.2 VOLTAGE up to 150 volts.

FOR ETIGH-NO.2 Voltages up to 150 volts.

FOR ETIGH-NO.2 Voltages between 150 and 300 volts.

PRAK HEATRE-CATHODE VOLTAGE.

Heater negative with respect to cathode.

Heater positive with respect to cathode.

volts volts ohms negohm cathode Plate Supply Voltage.
Grid No.3
Grid No.3
Grid No.3
Grid No.9
Cathode-Bias Resistor
Plate Resistance (Approx.)
Grid No.3
Grid No.3
Figure (Approx.)
Grid No.1 Voltage (Approx.) for transconductance of 50 µmhos. Characteristics:

********************************** The dc component must not exceed 100 volts. For fixed-bias operation.... Grid-No.1-Circuit Resistance:

Maximum Circuit Values: Plate Current. Grid-No.2 Current....

megohm megohm

0.25 max 1.0 max

TYPE 6DC6
E4 = 6.3 VOLTS
GRID-NE3 VOLTS=0
GRID-NE2 VOLTS=150 AVERAGE PLATE CHARACTERISTICS <u>ت</u> **VOLTS** GRID-NE

225 92CM-8330TI

SEMIREMOTE-CUTOFF PENTODE TWIN DIODE-

Miniature type used as rf- and vision receivers. Outline 8D, OUTcontact socket and may be mounted if-amplifier tubes in radio and tele-LINESSECTION. Tuberequiresnine in any position. Heater volts (ac/dc), 6.3; amperes, 0.3.



PENTODE UNIT AS CLASS A: AMPLIFIER

Values):
(Design-Center
Ratings,
2

	volta	voita	,	voits	volts	#W	watta	watts	÷	voits	volts
	550 max	300 max		125 max	300 max	16. 5 max	0.45 max	2.25 max		100 max	100 max
Maximum Ratings, (Design-Center Values):	PLATE SUPPLY VOLTAGE	PLATE VOLTAGE	GRID-NO.2 VOLTAGE:	With plate current greater than 8 ma	With plate current less than 4 ma.	CATHODE CURRENT.	GRID-NO.2 INPUT	PLATE DISSIPATION.	PEAR HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode	Heater positive with respect to cathode

volts	de at socket volts	volts	megohm 4mhos		nmhos.
250	Connected to cathode at socket	P 02	3800	91	200
200	Conne	-1.5	0.6 4500	3.3	120
Characteristics: Plate Voltage	Grid No.3.	Grid-No.1 Voltage Grid-No.1 Voltage Order Grid No.9 to Grid No.1	Transconductions	Plate Current. Grid-No. 2. Current	Transconductance, at grid-No.1 voltage of -20 volts.

Grid-No.1-Circuit Resistance... Maximum Circuit Values:

3 max megohms

DIODE UNITS (Each Unit)

MOCARMIN KUINGS, (LEGAM-CERE) PEAK INVERSE FLATE CURRENT AVERAGE PLATE CURRENT LATE AND AVERAGE PLATE CORRENT LATE AND AVERAGE PLATE CORRENT
--

volts ma

200 max 5 max 0.8 max



tube in horizontal-deflection circuits

6DE4

Glass octal type used as damper of television receivers. Outline 14F,

ated in any position. Socket terminals 1, 2, 4, and 6 should not be used as tie points. OUTLINES SECTION. Tube requires octal socket and may be oper-Related types: 17DE4, 22DE4

It is important that this tube, like other power-handling tubes, be adequately

ventilated.

volts	ăăă
5.3 1.6	8.5 11.5
HEATER VOUTAGE (AC/DC). HEATER CURRENT	DIRECT INTERSTRECTS ODE CAPACITANCES (Approx.): Plate to Cathode and Heater Cathode to Plate and Heater Heater to Cathode

DAMPER SERVICE For onsertion in a 525-line, 50-frame system

5500 max 1100 max 180 max	0.0
Maximum Ratings, (Design-Maximum Values): Peak Inverse Plate Voltage# Peak Plate Cubrent DO: Plate Cubrent	PLATE Dissipation

volts ma ma ma watts

= Technical Data =

Peak Hearer-Cathode Voltage: Heater orgative with respect to cathode. Heater positive with respect to cachode.	5500 max 300 max	volts volts
Characteristics, Instantaneous Value: Tube Voltage Drop for plate current of 350 ma.	34	volts
#the duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.	al scanning en icroseconds.	rcle. In
 The dc component must not exceed 900 volts. The dc component must not exceed 100 volts. 		

SHARP-CUTOFF PENTODE

controlled picture if stages of television quency in the order of 40 megacycles Miniature type used in the gainreceivers utilizing an intermediate freper second. Also used as an rf amplifier

6DE6 Related type:

minimize the effects of regeneration. Outline 7B, OUTLINES SECTION. Tube in vhi television tuners. This tube features very high transconductance combined with low interelectrode capacitance values, and is provided with separate base pins for grid No.3 and cathode to permit the use of an unbypassed cathode resistor to requires miniature seven-contact socket and may be mounted in any position.

volta ampere	•			ja	•	ď	
6.0 0.3	With	External	Shield	0.015 max		6.5	
	Without	External	Shield	0.025 max		6.5	
Heater Voltage (ac/dc) Heater Current			DIRECT INTERELECTRODE CAPACITANCES:	Grid No.1 to Plate.	Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3,	and Internal Shield	Plate to Cathode, Heater, Grid No.2, Grid No.3, and In-

	I man com as	L'informat	
DIRECT INTERELECTRODE CAPACITANCES: SI	Shield	Shield	
Grid No.1 to Plate.	0.025 max	0.015 max	jo
	:		•
	6.5	6.5	ď
Plate to Cathode, Heater, Grid No.2, Grid No.3, and In-			•
ternal Shield.	61	eo	ĕ
 With external shield connected to cathode. 			•
CLASS A, AMPLIFIER			
Maximum Ratings, (Design-Maximum Values):			
PLATE VOLTAGE.	:	330 max	volts
GRID-No.3 (SUPPRESSOR-GRID) VOLTAGE, Positive value	:	0 max	volts
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE	:	330 max	volts
GRID-NO.2 VOLTAGE	:::::	See curve page 70	page 70
Charles Management and Management Designation Library			

at socket	Connected to cathode at socket	Grid No.3
volts	125	:
volts	200 max	Heater positive with respect to cathode
voits	200 max	Heater negative with respect to cathode
2	-	PEAK HEATER-CATHODE VOLIAGE;
See curve page 70	See cur	For grid-No.2 voltages between 165 and 330 volts
‡	0 55 200	GRID-NO.2 INPUT: Don wid-No.9 welters up to 16% welts
watts	2.3 max	PLATE DISCIPATION.
volts	0 max	Grid-No.1 (Control-Grid) Voltage, Positive-bias value
See curve page 70	See cur	GRID-No.2 Voltage.
volts	330 max	GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE
volts	0 max	GRID-No.3 (SUPPRESSOR-CRID) VOLTAGE, Positive value
3	200	Transport of the state of the s

AVERAGE PLATE CHARACTERISTICS

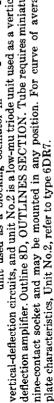
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TYPE GDE 6 Ege 4.3 VOLTS GRID AND INTERNAL SHIELD CONNECTED TO CATHODE AT SOCKET. GRID - NE 2 VOLTS = 1.25				-2	GRID-NII VOLTS ECI=-3		ľ
5°			-			11 1	Ħ
- 꽃 _					ž	#1	200
S F S	€C ±0				8	$\ \ $	lľ
- <u>50%</u>			1			##	Ħ.
- 25 3 8 5 —				1	\sqcup	444	
TYPE 6DE6 EF=6.3 VOLTS GRID N2.3 AN CONNECTED GRID-N2.2 VO			1				$\ $
					1	\coprod	TI.
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•	#E2	34MAI.	1111/11 3.	TAJ9	-		٠

227 92CM~8578TI

226

Grid-No.2 Supply Voltage
Cathode-Bias Resistor
Plate Resistance (Approx.)
Transconductance
Transconductance
Transconductance
Grid-No.1 Voltage (Approx.) for plate current of 20 µa
Flate Current.
Grid-No.2 Current.
Grid-No.2 Current.
Transconductance was exceed 100 volts.

DUAL TRIODE



	Miniature type used as combined 572分析ユ イ からい
DE7	vertical oscillator and vertical-de
hed types:	flection amplifier in television receiv- 67(2)
57, 13DE7	ers. Unit No.1 is a medium-mu triode
	unit used as a blocking oscillator in 772
-deflection circ	-deflection circuits, and unit No.2 is a low-mu triode unit used as a vertical-
on amplifier. O	on amplifier. Outline 8D, OUTLINES SECTION. Tube requires miniature
ntact socket a	ntact socket and may be mounted in any position. For curve of average
aracteristics, 1	naracteristics, Unit No.2, refer to type 6DR7.
VOLTAGE (AC/DC).	
URRENT	CURRENT.
NTERBLECTRUDE (4 8.5
to Cathode and 1	to Cathode and Heater.

HEATER VOLTAGE (AC/DC)		volts
Linguista Distriction of the Control		ampere
DIRECT INTERELECTRODE CAPACITANCES (ADDIOL.): Unit No.1	I Unit No.2	
	œ	ä
Colla to Cathodo and Honton	10	ā
	-	č
	•	ī
CLASS A, AMPLIFIER		
Characteristics.	I Unit No.2	
Plate Veltons	150	volts
		volts
Grid voltage.		
Distriction factors (America)	925	ohms
		soumn
	35	ma
Disto Correct for and walters of -24 volts	10	ma
Grid Voltage (Approx.) for plate current of 10 µs.	1 ;	volts
Grid Voltage (Approx.) for plate current of 50 µa	-44	volts
AVERAGE PLATE CHARACTERISTICS		

	- :						•	Şi]		00 4
						27				
				o'i	25.				H	300
		9.	18							 <u> </u>
å		_							//	200 PLATE VOLTS
	1/05							-		•
	, O ₄	CAIL							7	00
S. F.										
TYPE 6DE7 Er=6.3 VOLTS										

VERTICAL-DEFLECTION OSCILLATOR AND AMPLIFIER

Unit No.1 For operation in a 525-line, 30-frame system

Unit No.2

Onu No.z Amplifier	275 max	Zota noct	20m max-	20 000	THE OF
Oscillator	330 max	1 00	-400 max	X024	77m 77
Maximum Ratings, (Design-Maximum Values):	DC PLATE VOLTAGE,	PEAK POSITIVE-PULSE PLATE VOLTAGE#	PEAK NEGATIVE-PULSE GRID VOLTAGE	PEAK CATHODE CURRENT	AVERAGE CATHODE CURRENT

volts volts volts ma

= Technical Data

volts volts Watte 200 max 200 max 7 max 200 max 200 max 1.5 max PLATE DISSIPATION.
PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode
Heater positive with respect to

Maximum Circuit Values:

volta ohms megohm mhos

125 0.25 8000 700

volts ma

15.5

Grid-Circuit Resistance: For grid-resistor bias or cathode-bias operation....

The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 523-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

The dc component must not exceed 100 volts. 2.2 max megohms 2.2 max



BEAM POWER TUBE

Glass octal type used as output Outline 14C, OUTLINES SECTION. Tube requires octal socket and may tube in audio-amplifier applications. be mounted in any nosition. This tyne

	æ-		5 7	22
may be supplied with pin 1 omitted.	HEATER VOLTAGE (AC/DC)	DIRECT INTERELECTRODE CAPACITANCES (Approx.):	Grid No.1 to Plate.	Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3.

volts amperes

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AUDIO-FREQUENCY POWFE AMPLIFIED CIASS A.

CLASS AT AUDIO-PREQUENCY POWER AMPLINER		
Maximum Ratings, (Design-Center Values):		
PLATE VOLTAGE	200 max	volts
GRIPNO.2 (SCREEN-GRID) VOLTAGE.	125 max	volts
PLATE DISSIPATION	10 max	watts
GRID-NO.2 INPUT	1.25 max	watts
PEAK HEATER-CATHODE VOLTAGE:	i i	
Heater negative with respect to cathode	200 max	Volta
Heater positive with respect to cathode	zon002	VOITS
Typical Operation:		
Plate Supply Voltage	200	volts
	125	volts
	ן נ	volts
	œ.	volts
Cathode-Bias Resistor	180	ohms
	46	TLA
Maximum-Signal Plate Current	4.	ma
Zero-Signal Grid-No.2 Current.	N :	ma
	(C)	Bu.
	28000	ohms
Transconductance8000	8000	soum ₄
	4000	ohms
	10	per cent
Maximum-Signal Power Output2.1	œ.	watts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance:		•
For fixed-bias operation	0 5 22 02	megonm
for cathode-blas operation.	1	tire Roman

SHARP-CUTOFF PENTODE

The dc component must not exceed 100 volts.

Miniature type used as intermediate-frequency amplifier tube in television receivers. This tube features high transconductance at low plate and grid-No.2 voltages, combined with low

Es s

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6DK6

volts ampere interelectrode capacitances. Outline 7B, OUTLINES SECTION. Tube requires 0.025 max 6.0 8.0 miniature seven-contact socket and may be mounted in any position. HEATER VOLTAGE (AC/DC)

HEATER CURRENT
DIRECT INTEREIGEORGE CAPACITANGES:
Grid No.1 to Place
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.8, and
Internal Shield
Place to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield

3DK6, 12DK6 Related types:

ă

6.3 1.9

ቯ

CLASS A1 AMPLIFIER Maximum Ratings, (Design-Maximum Values):

watts volts

5000 max 300 max 6.5 max

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 552-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.
 The de component must not exceed 900 volts.
 The de component must not exceed 100 volts.

Glass octal type used as horizontal-deflection amplifier tube in television receivers having low B-supply voltages, Outline 25A, OUT-LINES SECTION. Tube requires octal socket. Vertical mounting is preferred, but horizontal

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€,

BEAM POWER TUBE

FEATE DISNITATION
PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode.
Heater positive with respect to cathode.

PLATE DISSIPATION.

= Technical Data

330 max volts 0 max volts 330 max volts See curve page 70 0 max volts 2.3 max vatts	0.55 max watt See curve page 70 200 max volts 200 max volts	125 125 125 125 16 0 35 me 980 -6.5 12 3.8
FLATE VOLTAGE. GRIDAO.3 (SUPERSSOR-GRID) VOLTAGE, Positive value GRIDAO.2 (SCREEN-GRID) SUPPLY VOLTAGE. GRIDAO.2 VOLTAGE. GRIDAO.1 (CONTRO-GRID) VOLTAGE, Positive-bias value. FLATE DISSIPATION. GRIDAO.9 LABORTO.	For grid-No.2 voltages up to 165 volts. For grid-No.2 voltages between 165 and 330 volts. PRAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater peatitive with respect to cathode.	Characteristics: Pate Supply Voltage Pate Supply Voltage Grid-No.2 Supply Voltage Grid-No.2 Supply Voltage Grid-No.2 Supply Voltage Carhode-Bias Resistor Flate Resistance (Approx.) Transconductance Grid-No.1 Voltage (Approx.) for plate current of 20 µs Flate Current Flate Current Grid-No.2 Current Transconductance Transconducta

TICS		GRID - NET VOLTS ECISO		-0.5	-	- EC:30	72.	900
AVERAGE CHARACTERISTICS	TED TO	2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -]	6 70	300 400 PLATE VOLTS
AVERAGE	SHIELD CONNECTED TO		-			102	· I	200
	TYPE 6DK6 E4=8.3 VOLTS GRID NE 3. AND INTERNAL CATHODE AT SOCKET. GRID - NE 2 VOLTS=125		-					8
	TYPE 6DK6 E,=6.3 vOLTS E,=6.3 vOLTS E,=6.3 vOLTS CATHODE 40 CATHODE 40 CATHODE 40	P	2021	и- ано	HO (41)		Ш	

HALF-WAVE VACUUM RECTIFIER

Related types: 12DM4, 17DM4 **6DM4**

Glass octal type used as damper tube in horizontal-deflection circuits of television receivers. Outline 14F, OUTLINES SECTION. Tube re-

ated in any position. Socket terminals 1, 2, 4, and 6 should not be used as tie points. quires octal socket and may be oper-

It is important that this tube, like other power-handling tubes, be adequately ventilated

HEATER VOLTAGE (AC/DC)
HEATER CURRENT
DIRECT INTERELECTRODE CAPACITANCES (Approx.):
Plate to Cathode and Heater
Cathode to Plate and Heater
Heater to Cathode DAMPER SERVICE

Maximum Ratings, (Design-Maximum Values):
PEAK INVERSE PLATE VOITAGE*
PEAK PLATE CURRENT
DC PLATE CURRENT For operation in a 525-line, 30-frame system

E 5

5000 max 1100 max 175 max

92CM-985ITI

9NG9 Related type: 25DN6 vertical plane. Heater volts (av/dc), 6.3; amperes, 2.5. Except for heater ratings, this type is identical with miniature type 25DN6. Type vertical-deflection-oscillator and ver-Glass octal type used as combined mounting is permissible if pins 1 and 3 are in tical-deflection-amplifier tube in television receivers. Outline 14B; OUT-LINESSECTION. Tuberequires octal 6DN6 is used principally for renewal purposes. MEDIUM-MU DUAL TRIODE

socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.9.

CLASS A, AMPLIFIER			
Characteristics	Unit No.1	Unit No.2	
Plate Voltage	250	250	volts
Crid Voltage	%	6	voits
Amplification Factor	22.5	15.4	
Plate Begintance (Approx.)	0006	2000	ohms
Transconductance	2500	7700	soque
Plate Current	œ	41	ma
Grid Voltage (Approx.) for plate current of 10 µa	-18	1	volts
Grid Voltage (Approx.) for plate current of 50 µa	ı	-23	volts
VERTICAL-DEFLECTION OSCILLATOR AND AMPLIFIER	4D AMPLIF	# <u></u>	

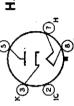
For operation in a 525-line, 30-frame system

The same of the sa			
	Unit No.1	Unit No.2	
Maximum Katings, (Design-Maximum Values):	Oscillator	Amphiner	
DC PLATE VOLTAGE.	350 max	550 max	volts
PEAK POSITIVE-PULSE PLATE VOLTACE#	E	2500 max	volts
PEAK NEGATIVE-PUISE GRID VOLTAGE,	400 max	250 max	ma
Peak Cathode Current		150 max	ma
AVERAGE CATHODE CURRENT	i	50 max	ma
PLATE DISSIPATION	1 max	10 max	watte
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	ZOO max	200 1102	Volts
Heater positive with respect to cathode,	200 max	200=max	volts
1			

Values:	stance:
Circuit	tit Resi
Maximum	Grid-Circu

2,2 max megohms - megohms	he duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a
2.2 max 2.2 max	of one vertica
	ed 15 per cent
	must not exce
ation peration	voltage pulse
d-Circuit Resistance: For fixed-bias operation. For eathode-bias operation.	ration of the
칊뛁쭕	he di

525-line, 30-frame system, 15 per cent of one vertical cycle is 2.5 milliseconds. ■ The dc component must not exceed 100 volts.



volts

amperes

8.5 11.5 4

HALF-WAVE VACUUM RECTIFIER

tube in horizontal-deflection circuits of television receivers. Outline 14E, OUT-LINES SECTION. Tube requires oc-Glass octal type used as damper

The socket and may be mounted in any position. Socket terminals 1, 2, 4, and 6 should not be used as tie points. Heater volts (ac/dc), 6.3; amperes, 1.2.

DAMPER SERVICE

Por operation in a 525-line, 30-frame system Maximum Ratings, (Design-Maximum Values):

5500 max	1000 max	175 max	6 max		5500 max	$300^{\circ}max$
PEAK INVERSE PLATE VOLTAGE	PEAK PLATE CURRENT	UC PLATE CURRENT	PLATE DISSIPATION	Prak Heater-Cathode Voltage:	Heater negative with respect to cathode	Heater positive with respect to cathode

ma ma watts volts volts

Characteristics, Instantaneous Value:

volts # The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

"The de component must not exceed 1900 volta.

"The de component must not exceed 100 volta."

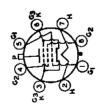
"The de component must not exceed 100 volta.

"The de component must not exceed 100 volta."

"The de component mus 8 Tube Voltage Drop for plate current of 250 ma

BEAM POWER TUBE

sion receivers. Outline 25A, OUT-LINES SECTION. Tube requires octal socket and may be mounted in any Glass octal type used as horizontal deflection amplifier in color televiposition.



HEATER VOLTAGE (AC/DG)	6.3	volta
HEATER CURRENT	2.5	ampere
DIRECT INTERELECTRODE CAPACITANCES (Approx):		
Grid No.1 to Plate	20.	0
Grid No.1 to Cathode. Heater, Grid No.2, and Grid No.3	23	. 6
Plate to Cathode, Heater, Grid No.2, and Grid No.3.	11	<u>.</u>
PLATE RESISTANCE (Approx.)*.	5500	ohme
Transconductance*	10500	4mbos
Mu-Factor, Grid No.2 to Grid No.1*	e0 60	
# December 100 - 175, 113 No 9 - 105, 105, 113 No 1 - 114, 115, 115, 115, 115, 115, 115, 115,	- 0 -M	

첫성병의의

* For plate volts, 175; grid-No.2 volts, 125; grid-No.1 volts, -25; plate ma., 110; grid-No.2 ma., ** For plate and grid-No.2 volts, 125; grid-No.1 volts, -25.

TYPE 60Q5 E = 0.3 YOLTS GRID-NE 2 VOLTS=125 MITTIVHLEGER (ZOI) Z 8 8 2 AVERAGE CHARACTERISTICS 00 PLATE VOLTS :1 ONIO-Nº 1 VOLTS EC1 -- 10 0=103 휣 Š 9 PLATE (T_b) MILLIAMPERES

82CM-8308T

HORIZONTAL DEFLECTION AMPLIFIER Por operation in a 525-line, 30-frame system Maximum Ratings, (Design-Maximum Values):

990 max 6500 max -1100 max -250 max 1100 max 315 max	
DC PLATE VOLTAGE PEAK POSTIVE-PULSE PLATE VOLTAGET PEAK NEGATIVE-PULSE PLATE VOLTAGET PEAK NEGATIVE-PULSE PLATE VOLTAGE DC GRID-NO-2 (SCREEN-GRID) VOLTAGE PEAK NEGATIVE-PULSE GRID-NO-1 (CONTROL-GRID) VOLTAGE PEAK CATHORE CURRENT AVERAGE CATHORE CURRENT	

ma sits

Heater negative with respect to eathode Heater negative with respect to cathode Heater positive with respect to cathode Adaminum Circuit Value: Grid-No.1-Circuit Resistance: O.47 max megohm O.47 max megohm	Grid-No.2 Input Platte Disstrations
	Heaten negative with respect to cathode. Heaten positive with respect to cathode. Bulls Temperature (At hottest point). Maximum Circuit Yolive:
	Grid-No.1-Circuit Resistance: For grid-resistor-blas operation
	r other means is required to protect the tube in th
f An adequate bias resistor or other means is required to protect the tube in the absence of excitation.	 The dc component must not exceed 100 volts.

TYPE 6DQ5 Eq. 8.3 VolTs GRIO-PR : VOLTS=0								009	92CM-B\$IIT
C++6.			53W3	48417	C\$) MH	} ;) s m	-GI49	88	
					\$ \	-21	91	***	/OLTS
	<u>š</u> /	9	F	ORIO-W 2 VOLTS EC22			EC 2 129	300	PLATE VOLTS
08 1203 103	1			0 110 - WP 2	1.		3	200	i
+			1				V	ç	
		§	AMAIJJI	\$			1]	

BEAM POWER TUBE	Glass octal types used as horizon	tal-deflection-amplifier tubes in high	efficiency deflection circuits of tele	vision receivers. Outline 21, OUT	LINES SECTION. Tubes requir
0/ 0/			シング	(P)	¥ij [°] o

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6DQ6A 6DQ6B Related types: 12DQ6A, 12DQ6B, .17DQ6A, 17DQ6B 무두 후탁 5

volts octal socket and may be mounted in any position. These types may be supplied with pin 1 omitted. Type 6DQ6-A is used principally for renewal purposes. es e

Hearen Voltage (ac/DC)				6.3	volts
HEATER CURRENT			:::::::::::::::::::::::::::::::::::::::	2.	2 mperes
DIRECT INTERELECTRODE CAPACITANCES (Approx.)	s (Approx.			75	Ē
Grid No.1 to Cathode. Heater, Grid No.2, and Grid No.3.	d No.2, an	d Grid No.3		15	ī ā
Plate to Cathode, Heater, Grid No	.2, and Gr	id No.3		t ~	ă
	CLASS A	CLASS A, AMPLIFIER			
Characteristics	909	6D06-A	6D06-B	B	
Dieto Voltage	9	250		250	volts
Caid-No 9 Voltogo	150	150	150	150	volte
Cald-No 1 Voltage	•	-22.5	0	-22.5	volta
Plate Resistance (Annous.)	, I	20000	ı	18000	ohme
Transfordistance	ı	0099	1	7300	
Plate Current	315°	22	345°	55	##
Grid-No.2 Current	220	1.5	2.10	89.	EU.
Grid-No.1 Voltage (Approx.) for					
grid-No.2 volts=150, plate ma=1,		9		64	volta
plate volts=250	ı	2	ı	5	volta
plate volts=5000	1	101-	ı		1
HORIZO	NTAL-DEF	HORIZONTAL-DEFLECTION AMPLIFIER	LIFIER		

	volts volts	233
	6500 max 6500 max	
	6DQ6-A 770 max 6000 max	
Lor opening and a second of the second of th	Maximum Ratings, (Design-Maximum Values): DC PLATES SUPPLY VOLAGE PEAR POSITIVE-PULSE PLATE VOLTAGE	

200 max	200 max	Hoster positive with respect to eathode		-1500 max 220 max -330 max 540 max 155 max 3.6 max 200 max	-1500 max -320 max -330 max 610 max 175 max 3.6 max 200 max	
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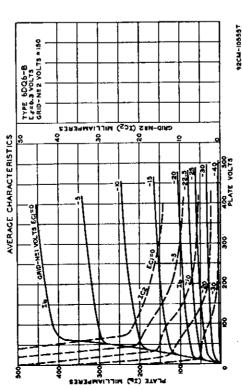
volts volts ma ma watts

volts volts

Maximum Circuit Values:

megohm 1 max 1 max Grid-No.1-Circuit Resistance for grid-resistor-bias operation...

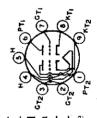
This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.
The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a \$25-line, 30-frame system; 15 per cent of one horizontal scanning cy.le is 10 microseconds.
An adequate bias resistor or other means is required to protect the tube in the absence of excitation.
The dc component must not exceed 100 volts.



DUAL TRIODE

LINESSECTION Tube requires minbined vertical-deflection-oscillator and vertical-deflection-amplifier tube in television receivers. Outline 8D, OUTiature nine-contact socket and may be Miniature type containing highmu and low-mu triodes; used as comoperated in any position.

> Related types: 10DR7, 13DR7 6DR7



volts ampere	jaja
6.9 6.9	Unit No.2 8.5 5.5 1
HEATER VOLTAGE (AC/DC). Heater Cherent	Direct Interelectrode Capacitances (Approx.): Unit No.1 Grid to Plate. 4.5 Grid to Cathode and Heater. 2.2 Plate to Cathode and Heater. 0.34

volts volts

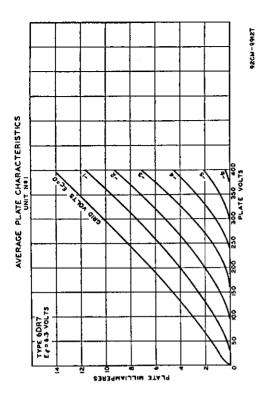
Unit No.2 150 -17.5 625 6500

ohms µmhos volts volts

8 8 8

HEATER CURRENT. DIRECT INTERELECTRODE CAPACITANCES (Approx.): Unit No.1	Unit No.1	
Grid to Cathode and Heater.	; c4	
Plate to Cathode and Heater.	0.34	
CLASS A, AMPLIFIER		
Characteristics	Unit No.1	
Plate Voltage	250	
Grid Voltage	က္	
Amplification Factor	\$600	
Plate Resistance (Approx.)	1600	
Transconductance.	-5.5	
Grid Veltage (Approx.) for plate current of 50 µa	; ;	
Plate Current for grid voltage of -24 volts.	or 1	

= Technical Data



VERTICAL-DEFLECTION OSCILLATOR AND AMPLIFIER

For operation in a 525-line, 30-frame system

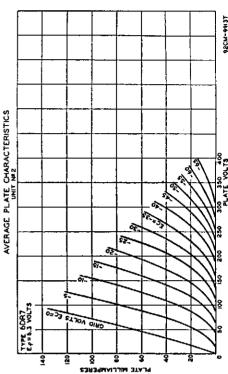
	Unit No.1	Unit No.2	
Maximum Ratings, (Design-Maximum Values):	Oscillator	Amplifier	
DC PLATE VOLTAGE	330 max	275 max	volts
PEAK POSITIVE-PULSE PLATE VOLTAGES#	ı	1500 max	volts
PEAK NEGATIVE-PUISE GRID VOLTAGE	-400 max	-250 max	volts
Prak Cathode Current	70 max	175 max	æ
AVERAGE CATHODE CURRENT.	20 max	50 max	ma
PLATE DISSIPATION.	1 max	T max	Watte
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	200 max	200 max	volts
Heater positive with respect to cathode	$200^{4}max$	200^4max	volts

Maximum Circuit Value:

2.2 max megohms 2.2 max Grid-Circuit Resistance: For grid-resistor-bias or cathode-bias operation......

The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

* The de component must not exceed 100 volts.



HIGH-MU TRIODE

6DS4 Related type: 2054

Because of its cutoff characteristics, the 6DS4 is used in circuits to reduce Nuvistor type used as grounded cathode, neutralized rf amplifier in vh tuners of television and FM receivers

6 3 0.135 HEATER VOLTAGE (AC/DC)
HEATER CURRENT
DIRECT INTERELECTRODE CAPACITANCES (Approx.):
Grid to Plate
Grid to Plate
Grid to Cathode, Heater, and Shell
Plate to Cathode
Heater to Cathode cross-modulation distortion. Outline 1, OUTLINES SEC. TION. Tube requires nuvistor socket and may be operated in any position.

INDEX = LANGE LUC
194 : 20 (74

•	GE LUG	volts ampere	ja

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	0.92	4	1.00	0. 18 0. 18	9.1	
						AMPLIFIER

Characteristics. ClASS A, AMPLIFER Plate Supply Voltage. Grid Supply Voltage. Cathode-Blas Resistor Amplification Factor. Plate Resistance (Approx.) Transconductance (Approx.) Grid Voltage (Approx.) for plate current of 100 µa. Grid Voltage (Approx.) for plate current of 10 µa.		110		_			<u>~</u>	6.5		8.9
CLASS A, AMPLI Lage Lage lage ctor ctor (Approx.) prox.) for plate current of 100 µa.	FIER									
tage classe ctor ctor ctor ctor ctor ctor ctor ctor	SS A, AMPLI								100 дв	10 ма
tage tage teles te	ᄗ								ate current of	ate current of
		tage	tage.	Bistor	ctor	(Approx.)	99		pprox.) for plo	oprox.) for pla

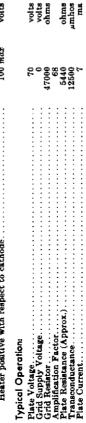
volts volts ohms

ohma mhos ma volts

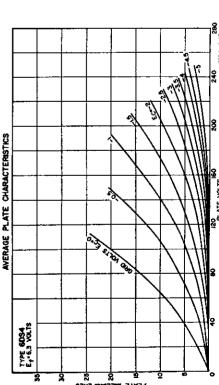
300° max	135 mar	SO THERE	o max	1 5 7402	15 max	100 max 100 max
PLATE SUPPLY VOLTAGE.	PLATE VOLTAGE.	GRID VOLTAGE, Negative-blas value.	GRID VOLTAGE, Feak positive value.	PLATE DISSIPATION	CATHODE CURRENT.	PRAK HEATER-CATHODE VOLAGE: Heater negative with respect to cathode. Heater positive with respect to cathode.

Maximum Ratings, (Design-Maximum Values):

volts volts volts volts watt



volts volts ohms



Maximum Circuit Values

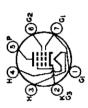
- Technical Data

Grid-Circuit Resistance:
For fixed-bias operation.....
For cathode-bias operation...

For exthode-bias operation.

2. Z max megohins
A pate supply voltage of 300 volts may be used provided a sufficiently large resistor is used in the plate circuit to limit the plate dissipation to 1. 5 watts under any condition of operation.

For operation at metal-shell temperatures up to 125°C.

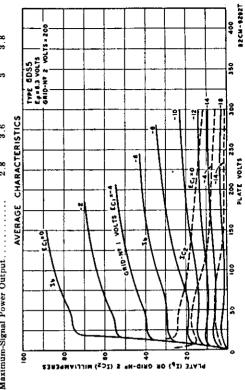


BEAM POWER TUBE

Miniature type used in the audio output stages of television and radio receivers. Outline 7C, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position.

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HEATER VOLTAGE (AC/DC) HEATER CURENT HEATER CURENT OFFICE INTEREMENT OF THE CAPACITANCES (Approx.): Grid No.1 to Plate Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.8 Plate to Cathode, Heater, Grid No.2, and Grid No.8	.): 1 Grid N d No.3	80		6.3 0.19 9.5 6.3	voits ampere pf pf
Cum V	AMPLIFI ss value.	LASS A, AMPLIFIER alues): stive bias value		276 max 276 max 0 max 9 max 2.2 max	volts volts volts watts
FEAR TRAINER-CARRONDE VOLTAGE. Heater negative with respect to cathode. BULB TEMPERATURE (At hottest point). Typical Operation and Characteristics:	Cathode-Bias	e-Bias	Fixed	200 max 200*max 250 max Fixed-Bias	volts volts °C
Plate Supply Voltage Grid-No.2 Supply Voltage Grid-No.1 Voltage	288	250 200 -	200 200 -7.5	250 200 -8.5	volts volts volts
Cathode-Bias Resistor Peak AB Grid-No.1 Voltage Zero-Signal Plate Current	24 7 180 27 5 50	9.50 9.50 9.50	7.51	8.5 25.5	ohms volts ma
Maximum-Signal Plate Current Zero-Signal Grid-No.2 Current Maximum-Signal Grid-No.2 Current	82 82 82 82 82 83 83 84 84 84 84 84 84 84 84 84 84 84 84 84	20 00 00 00 00 00 00 00 00 00 00 00 00 0	88 88 80 80 80 80 80 80 80 80 80 80 80 8	28°29	
Transconductance (Appliox) Coad Resistance Coad Harmonic Distortion Maximum-Signal Power Output	6000 10 10 8.8	2800 5800 8000 3.6	0009 0009	\$000 \$000 \$000 \$.8	ohma ohma per cent



237

Grid-No.1-Circuit Resistance: For fixed-bias operation. For exhode-bias operation A The dc component must not exceed 100 volts.

megohm педонт

0.1 max 1.0 max

HALF-WAVE VACUUM RECTIFIER of color television receivers. Outline Glass octal type used as damper tube in horizontal-deflection circuits 14F, OUTLINES SECTION. Tube

mounted in any position. Socket terminals 1, 2, 4, and 6 should not be used as requires octal socket and may be

DAMPER SERVICE

tie points. Heater volts (ac/dc), 6.3; amperes, 1.2.

For operation in a 525-line, 30-frame system

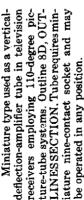
;	volta	EUI	ma	watts	volts	3
	5500 max	1450 max	235 max	7.5 max	5500 max	200
MOXIMUM KOINGS, (Design-in arrang Mines)	PEAR INVERSE PLATE VOLTAGE	PEAK PLATE CURRENT.	DC PLATE CURRENT	PLATE DISSIPATION.	PEAK INEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Under negative with respect to cathode.	restrant ingrates and restrant to the contract of the contract

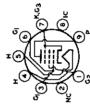
volts The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a
525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.
 The dc component must not exceed 900 volts. Tube Voltage Drop for plate current of 350 ma. Characteristics, Instantaneous Value:

The dc component must not exceed 100 volts.

BEAM POWER TUBE

Related type: 12015





volts amperes 4mhcs
6.3 1.2 6200
De Operation and Position. HEATER VOLTAGE (AC/DC) TAANSCONDUCTANGE*

VERTICAL-DEFLECTION AMPLIFIER

* For plate and grid-No.2 walts, 250; grid-No.1 volts, -16.5; plate ma., 44; grid-No.2 ma., 1.5.

For operation in a 525-line, 30-frame system

ve system	315 max volts	295 max -250 max	190 max 55 max	9 max W	200 max 200*max	0.5 max meg
Maximum Ratings, (Design-Haximum Values):	DC PLATE VOLTAGE.	GRID-NO.2 (SCREEN-GRID) VOLTAGE. PEAR NEGATIVE-PUSE GRID-NO.1 (CONTROL-CRID) VOLTAGE.	PEAK CATHODE CURRENT. AVERAGE CATHODE CURRENT	PLATE DISSIPATION. Grid-No.2 Input	PEAK HEATER-CATHODS VOLTAGE: Heater negative with respect to cathode Heater positive with respect to cathode	Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-bias operation For exthode-bias operation

= Technical Data

SHARP-CUTOFF PENTODE

Miniature type used as FM detector in television receivers. Outline quires miniature seven-contact socket and may be mounted in any position. 7B, OUTLINES SECTION. Tube re-

6DT6A

6DT6

3DT6A, 4DT6A Related types:

Type 6DT6 is a DISCONTINUED type listed for reference only.

volta	ampere	ididi	
6.3	e 0	0.02 5.8 1.4† 0.1	
Heater Voltage (ac/dc)	HEATER CURRENT.	Direct Interest. Sortions Capacitances (Approx.)* Grid No.1 to Plate Grid No.2 Grid No.3, and Internal Shield Grid No.1 to Plate Grid No.3 to Plate Grid No.1 to Grid No.3 Grid No.3 to Cathode, Heater, Grid No.1, Grid No.2, and Internal Shield Grid No.3 to Cathode, Heater, Grid No.1, Grid No.2, and Internal Shield	*External shield connected to cathode. For type 6DT6-A, value is 1.7 $\mu\mu$ f.

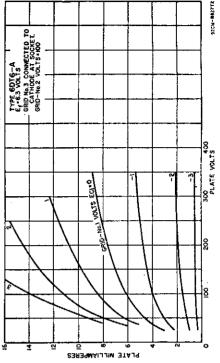
CLASS A. AMPLIFIER **Characteristics**:

FIER 6DT6-A 6DT6		032	000 000 · · · · · · · · · · · · · · · ·	0.15 0.15 me		1350 15 me	0.15 0.15 me 1350 800 me 515 515 1.1	1350 800 L	0.15 0.16 megohm 1350 800 mmhos 1615 511 mmhos 1.55 1.1 mps 1.8 2.1 ms
Characteristics: CLASS A ₁ AMPLIFIER	Grid No.3 (Suppressor Grid) Grid-No.2 (Screen-Grid) Supply Voltage		Jias Resistor	athode-Bias Resistor Pate Resistance (Approx.)	as Registor stance (Approx.)	as Resistor stance (Approx.) ductance, Grid No.1 to Plate. ductance, Grid No.3 to Plate.	Cathode-Bias Resistor Thate Resistance (Approx.) Transconductance, Grid No.1 to Plate Transconductance, Grid No.3 to Plate Transconductance, Grid No.3 to Plate	athode-Bins Registor. Jako Resistance (Approx.) Iransconductance, Grid No.1 to Plate Iransconductance, Grid No.3 to Plate Jaro Current Jardo Luzent Jardo Low Z. Current	Cathode-Bits Resistor Plate Resistance (Approx.) Transconductance, Grid No.1 to Plate Transconductance, Grid No.3 to Plate Plate Current Flate Current Crid-No.2 Current Crid-No.2 Current of plate current of 10 µs.

•	volts	volts	volts	See curve page 70	volts	watts		watts	See curve page 70	,	volts	
	330 max	28 max	330 max	See cura	max 0	1.7 max		1.1 max	See cur		200 max	200 max
Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE.	GRID-NO.3 VOLTAGE.	GRID-NO.2 SUPPLY VOLTAGE	GRID-NO.2. VOLTAGE.	GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	PLATE DISSIPATION	GRID-NO.2 INPUT:	For grid-No.2 voltages up to 165 volts	For grid-No.2 voltages between 165 and 330 volts.	Peak Heater-Cathode Voltage:	Heater negative with respect to cathode	Heater positive with respect to cathode

megohm megohm 0.25 max 0.5 max Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation. ■ The dc component must not exceed 100 volts. Maximum Circuit Values:

AVERAGE PLATE CHARACTERISTICS



239

The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

The de component must not exceed 100 volts.

RCA Receiving Tube Manual =

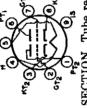
AVERAGE CHARACTERISTICS

920M-00287 TYPE EDT6-A E1-6.3 VOLTS GRID No.3 CONNECTED TO CATHODE AT SOCKET. GRID-No.2 VOLTS-100 PLATE VOLTS GRIO-No. VOLTS 6RID-No.2 (IC2) 80 (_I⊅I) 10N~0I89

HIGH-MU TWIN TRIODE

Related type: 12DT8

Miniature type used in a wide variety of applications in radio and television receivers. Especially useful



respect to cathode, 200 max; heater positive with respect to cathode, 200 max; (the de component must not exceed 100 volts). Except for heater and heater-cathode quires miniature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.3. Peak heater-cathode volts: heater negative with ratings, interelectrode capacitances, and basing arrangement, this type is identical quency converter in FM tuners. Outline 8B, OUTLINES SECTION. Tube rein push-pull rf amplifiers or as frewith miniature type 12AT7.

DIRECT INTERELECTRODE CAPACITANCES (Approx., Each Unit Except as Noted):

Grid to Plate
Grid to Cathode, Heater, and Internal Shield
Plate to Cathode, Heater, and Internal Shield
Heater to Cathode
Grid Heater, and Internal Shield (Unit No.2)
Pate to Grid, Heater, and Internal Shield (Unit No.2)

annaaa.

With external shield connected to cathode of unit under test. With external shield connected to ground. With external shield connected to grid of unit under test.

MEDIUM-MU TRIODE



\equiv		•			•
Nuvistor type used at frequencies	up to 1000 megacycles in uhf oscillator	stages of television receivers. Outline	1, OUTLINES SECTION. Tube re-	quires nuvistor socket and may be	mounted in any position.

<u> </u>	INC THORT	ō	•
6DV4 up to 1000 megacycles in uhf oscillator stages of television receivers. Outline 1. OUTLINES SECTION. Tube re-	2DV4 quires nuvistor socket and may be mounted in any position.	Heater Voltage (ac/dc). Heater Current Direct Interelectrode Capacitances (Approx.):	Grid to Fakee, and Shell Grid to Cathode, Heater, and Shell Plate to Cathode, Heater, and Shell Plate to Cathode Heater to Cathode Grid to Cathode

//-0	AOT USE
3/ ! (EX-LARGE LUG
	INDE

volts

ampere

SECTION. Tube requires novar nine-	contact socket and may be mounted in any position. Socket terminals 1, 3, 6, and 8	should not be used as tie points; it is recommended that socket clips for these pins	be removed to reduce the possibility of arc-over and to minimize leakage. It is	especially important that this tube, like other power-handling tubes, be adequately	ventilated.
------------------------------------	--	--	---	---	-------------

222222

CLASS A. AMPLIFIER

= Technical Data

CLASS AT AMPLITIES			
Махітит Ratings, (Design-Maximum Values): Plate Superix Voirags Late Voirags	300 max 125 max		volts volts
GRID VOLTARBE: Negative-bias value Peak positive value PLATE Dissipation CATHOUS CURRENT.	-55 max 2 max 1 max 15 max	222	volts volts watt ma
PERK HEKER-(ARROCA VOITAGE) Heater negative with respect to cathode Heater positive with respect to cathode	100 max 100 max		volts volts
Characteristics: Plate Supply Voltage Cathode-Bias Resistor	100	-	volts ohms
Applineshon Factor. Plate Resistance (Approx.) Transconductance Grid Voltage (Approx.) for plate current of 10 µa. Plate Ourrent.	3100 11500 10.5	- ii.	ohms mhos volts ma
Typical Operation as Oscillator at 950 Mc. Plate Voltage Grid Voltage Grid Resistor. Plate Current. Grid Current.	60 5600 8 350	·	volts volts ohms ms ms
Махіmum Circuit Values: Grid-Circuit Resistance: ° For faxel-bias operation For exthode-bias operation * For operation at metal-shell temperatures up to 135°C.	0.1 max 0.2 max		megohm megohm

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TYPE 6DV4 E4=6.3 VOLTS		20		'ST 618	9	\mathcal{M}	
Eff	<u> </u>	AMPERE 3					ļ

HALF-WAVE VACUUM RECTIFIER

Novar type used as damper tube in horizontal-deflection circuits of color and black-and-white television re-

volts amperes	ď	a a
6.3		. 62 . 80
Heater Voltage (ac/dc). Heater Current	DIRECT INTERELECTRODE CAPACITANCES (Approx.): Plate to Cathode and Heater.	Cathode to Plate and Heater

DAMPER SERVICE

For operation in a 525-line, 30-frame system Maximum Ratinas, (Design-Maximum Values):

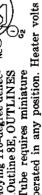
-dian	200	ana a	Bu.	watta		volts	volts	
5000 mass	2000	1300 max	250 max	8.5.max		5000 max	300°max	
The second secon	ERAK INVERSE FLAIM VOLINGE	PEAK PLATE CURRENT.	DC PLATE CURRENT.	PLATE DISSIPATION	PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode	Heater positive with respect to cathode	

Tube Voltage Drop for plate current of 350 ma... Characteristics, Instantaneous Value:

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 555-line, 80-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.
 The de component must not exceed 900 volts.
 The de component must not exceed 100 volts.
 The de component must not exceed 100 volts.

BEAM POWER TUBE

Miniature type used in vertical SECTION. Tube requires miniature deflection amplifier service in television receivers employing 110-degree deflection systems. Outline 8E, OUTLINES



nine-contact socket and may be operated in any position. Heater volts (ac/dc), 6.3; amperes, 1.2.

$Triode$ $Connection^{\circ}$	150 22 1 4.3 4.3 1 1 1 1 1	
Pentode Connection	60 200 150 150 0 22.5 15000 15000 260 55	
CLASS A ₁ AMPLIFIER	Plate Voltage Grid-No.2 Voltage Grid-No.2 Voltage Grid-No.2 Voltage Grid-No.2 Voltage Plate Resistance (Approx.) Plate Resistance (Approx.) Plate Current Grid-No.2 Current Grid-No.2 Current Grid-No.1 Voltage (Amrox.) for plate current of 0.1 ma	,

volts volts volts

ohms #mhos

VERTICAL DEFLECTION AMPLIFIER

600 For operation in a 525-line, 30-frame system Maximum Ratings, (Design-Maximum Values):

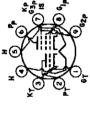
	VOILE	volts	volts	voits	ma	10.8	watts	watts	į	Volts	volts
000	aso max	2200 max	220 max	-250 max	225 max	65 max	11 max	2.5 max	;	200 max	200*max
Comment of the Commen	DC PLATE VOLTAGE	PEAK POSITIVE-PELSE PLATE VOLTAGE*	DC GRID-NO.2 (SCREEN-CRID) VOLTAGE	PRAK NEGATIVE-PUISE GRID-NO.1 (CONTROL-GRID) VOLTAGE.	PEAK CATHODE CURRENT.	AVERAGE CATHODE CURRENT.	PLATE DISSIPATION.	GRID-NO.2 INPUT	PRAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode	Heater nowitive with respect to cathode

Grid-No.1 Circuit Resistance:
For cathode-bias operation..... Maximum Circuit Values:

With grid No.2 connected to plate.

"This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

This value duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a \$25-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.



SHARP-CUTOFF PENTODE HIGH-MU TRIODE.

receiver applications. The triode unit tube. The pentode unit is used as a Miniature type used in televisionis used as a sync-separator, sync-amplifier, keyed-agc, or noise-suppressor

Related type: 100X8 video-output tube. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.72.

CLASS A AMPLIFIER				
	Triode	Pentode	ode	
Maximum Ratings, (Design-Center Values):	Unit	U_{nn}	222	
PLATE SUPPLY VOLTAGE, PBAK PLATE VOLTAGE, with maximum plate current of 0.1 ma °	550 max 600 max	550 max _	max	volts volts
PLATE VOLTAGE. OBID-NO.2 (SCREEN-ORID) STPPLY VOLTAGE	300 max	300	max	volts
GRID-NO.2 VOLTAGE.	1 4	88	Max	volts
CATHODE CURRENT. GRID-No.2 Input.	12 max -	40 max 1.7 max	max	ma Watts
PLATE DISSIPATION.	1 max	4	max	Watts
FEATURE TRANSFORM TO THE TOTAL TO THE TRANSFORM TO THE TOTAL THE TOTAL TO THE TOTAL THE TOTAL TO THE TOTAL THE TOTAL TO THE TOTAL THE TOTAL TO THE TOTAL THE TOTAL TO THE TOTAL THE TOTAL TO AL TO THE TOTAL TO THE T	200 max 200 max	200	max	volts
L				
Characteristics: Unit	Pentode Unit	77.		
. 200		220		volts
Grid-No.1 Voltage.	- 6 KO	22.5 2.4 4.4		volts
. 65		1 %		
Plate Keasstance (Approx.) 0.1 Transconductance 0.1	0.13 10400	0.15 10000		megohm µmhos
	စ္ဆာ	818		E E
of Pentode Unit as Video Output Tul	200	220		volts
₩	3000 200 3000	3000		ohms volts
Grandra voltage. Transconductance. Plate Current.	10000 18	9700 18		voita emhos
Grid-No.2 Current. 3.2	3.1	3.1		roa

MEDIUM-MU TRIODE

. With maximum duty factor of 0.18 and maximum pulse duration of 18 microseconds.

For fixed-bias operation. Grid-No.1-Circuit Resistance: Maximum Circuit Values:

1 max megohm 2 max megohms

ceivers covering the frequency range megacycles. Outline Miniature type used as a local-7A, OUTLINES SECTION. Tube reoscillator tube in uhf television rerom 470 to 890

Related types:

quires miniature seven-contact socket and may be mounted in any position. For curve of average plate characteristics, refer to type 6AF4-A.

HEATER VOLTAGE (AC/DC). HEATER TOURISM	6.3	volts ampere
UMECT INTERELECTROBE CAPACITANCES (Approx.) Grid to Plate Grid to Cathode and Heeter	2.2	ăă
Plate to Cathode and Heater	1.3	jd

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volts	ohms		ohmis o	South	ma	volts	
80	2700	14	2000	6700	15	-11	
Plate Supply Voltage.	Flate Resistor	Amplineation Factor	Plate Kesistance (Approx.)	Fransconductance.	Plate Current.	Grid Voltage (Approx.) for plate current of 20 µa	

Plate Current. Grid Voltage (Approx.) for plate current of 20 µa.	15 -11	ma
UHF OSCILLATOR		
Moximum Ratings, (Design-Maximum Values):		
PLATE VOLTAGE	135 max	volts
GRID VOLTAGE, Negative-bias value.	-50 max	volts
GRID CURRENT	2 max	108
CATHODE CURRENT	20 max	ma
PLATE DISSIPATION	2.8 max	watts
Peak Heater-Cathods Voltage: Heater negative with respect to eatherde	50 max	volts
	50 = max	volts
Typical Operation as Oscillator at 1000 Mc.		
Plate Supply Voltage	135	volts
Plate-Circuit Resistance	2700	ohms
Grid Registor	10000	opms
		i

Piate Supply Voltage Prate-Circuit Resistance. Grid Resistor Plate Current. Grid Current (Approx.) Maximum Circuit Values

ma

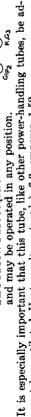
esistance:	For fixed-bias operation.	For cathode-bias operation
Grid-Circuit Resistance:	For fixed-bias operatio	For cathode-bias opera

The dc component must not exceed 25 volts.

Not recommended 0.5 max megohm

. TWIN POWER PENTODE

(E) Za Glass octal type used as power amplifier tube in high-fidelity audio equipment. Outline 19A, OUTLINES SECTION. Tube requires octal socket



equately ventilated. Heater voltage (ac/dc), 6.3; amperes, 1.52.

CLASS A, AMPLIFIER

Characteristics, (Each Unit):

	250	250	-7	38000	11300	84	9.9
	Plate Voltage	Grid-No.2 (Screen-Grid) Voltage	Grid-No.1 (Control-Grid) Voltage	Plate Resistance (Approx.)	Transconductance	Plate Current.	Grid-No.2 Current,
				:	:	٠	
	:	:		:	:	:	:
	:	:	:	:	:	1	:
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volts volts volts ohms

PUSH-PULL CLASS AB, AMPLIFIER

Tube:
Per
Values,
Design-Maximum
3
Ratings
Maximum

	Bias	Bias	Typical Operation, (Per $Tube$):
	Cothode	Fired	
volts	$200^{\circ}max$		Heater positive with respect to cathode
volts	200 max		Heater negative with respect to cathode
•			PEAK HEATER-CATHODE VOLTAGE:
watts	13.2 max		PLATE DISSIPATION.
watts	4 max		GRID-No.2 INPUT (Total)
volts	300 max		GRID-NO.2 VOLTAGE
volta	440 max		PLATE VOLTAGE.

= Technical Data Zero-Signal Plate Current. Maximum-Signal Plate Current. Maximum-Signal Plate Current. Maximum-Signal Grid-No.2 Current. Effective Load Resistance (Plate-to-Plate) Maximum-Signal Power Output. Maximum Circuit Values, (Each Unit):

ma ma ma ma ohms per cent

megohm

TOW.

27

ELECTRON-RAY TUBE

The dc component must not exceed 100 volts.

Grid-No.1-Circuit Resistance

voltage. It is used as a convenient Glass type used to indicate visually by means of a fluorescent target the effects of a change in a controlling means of indicating accurate radio-

Related type:

receiver tuning. Maximum dimensions: over-all length, 4-3/16 inches; seated height, 3-9/16 inches; diameter, 1-3/16 inches. Tube requires six-contact socket. Heater volts (ac/dc), 6.3; amperes, 0.3. For additional considerations, refer to Tuning Indication with Electron-Ray Tubes in ELECTRON TUBE APPLICATIONS SECTION.

ACTACION GNINIT

Marie and Minimum Potings (Design-Center Values):		
PLATE-SUPPLY VOLTAGE.	250 max	volts
TARGET VOLTAGE,	125 min	volts volts
Typical Operation: Plate and Target Supply Voltage	250	volts
Series Triode-Plate Resistor		megohm
Targee Current* 0.19	0.24	ma
Triode-Grid Voltage (Approx.): For shadow angle of 0	0.8	volts
For shadow angle of 90'* * For zero triode-grid voltage. † Subject to wide variations.	>	A OI CR

TWIN POWER TRIODE

either push-pull or parallel circuits. Outline 27, OUTLINES SECTION. Heaver volts (ac, dc), C3, amperes, 0.6. With plate volts of 250 and grid volts of -27.5, characteristics for each unit Glass type used as class A₁ amplifier in are: plate ma., 18; plate resistance, 3500 ohms;

6E6

transconductance, 1700 µmhos; amplification factor, 6. With plate-to-plate load resistance two tubes is 1.6 watts. This is a DISCONTINUED type listed for ref-REMOTE-CUTOFF PENTODE of 14000 ohms, output for erence only.

6E7

Glass type used in rf and if stages of radio receivers employing avc. Outline 24A, OUT-LINES SECTION. Except for interelectrode capacitances, this type is identical electrically with type 6UT-G. Heater volts (ac/dc), 6.3; amperes, 0.3. This is a DISCONTINUED type listed for reference only.

SHARP-CUTOFF TETRODE

Tube requires miniature seven-contact Miniature type used as rf amplifier in vhf tuners of television receivers. Outline 7B, OUTLINES SECTION. socket and may be operated in any position.

6EA5 Related type: volts ampere

8 C

Heater Voltage (ac/dc). Heater Current

volts volts volts ohms

250 250 120 120 22

21.250

Piate Voltage.
Grid-No.2 Voltage.
Grid-No.1 Voltage.
Cathode-Bias Resistor
Peak AF Grid-No.1-to-Grid-No.1 Voltage.

	Without	With	
	DESCRIPTION OF	CELETRAL	
DIRECT INTERELECTRODE CAPACITANCES:	Shield	$Shield^{\circ}$	
Grid No.1 to Plate	0.06 max	0.05 max	
Grid No.1 to Cathode, Heater, Grid No.2, and Internal Shield	8.8	4.5	
Plate to Cathode, Heater, Grid No.2, and Internal Shield	63	တ	
 With external shield connected to cathode. 			

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CLASS A, AMPLIFIER

Maximum Ratings, (Design-Maximum Values):			
PLATE VOLTAGE	250 max	volta	
GRID-NO.2 (SCREEN-GRID) VOLTAGE	150 max	voits	
GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value.	0 max	volts	
CATHODE CURBENT	20 max	ma	
Control of North	0.5 max	watt	
PLATE DISSIPATION	3.25 max	watts	
PEAK HEATER-CATHODE VOLTAGE: Heater negstive with respect to cathode.	200 max	volts	
Heater positive with respect to cathode	200 = max	voits	
	950	voite	
Flate Voltage	20.	2010	
Grid-No.2 Voltage	140	VOIES	
Grid-No.1 Voltage,	7	volt	
Plate Resistance (Approx.)	0.15	megohm	
Transconductance	8000	Boquari	
Plate Current.	10	ma	
Grid-No.2 Current	0.95	ma	
Grid-No.1 Voltage (Approx.) for transconductance of 100 µmhos or less	9	volts	
The de component must not exceed 100 voits.			

DUAL TRIODE

and vertical deflection amplifier in tele-Glass octal type containing hightriode in same envelope. Used as a mu triode and high-perveance, low-mu combined vertical deflection oscillator

vision receivers. Outline 14B, OUTLINES SECTION. Tube requires octal socket and may be operated in any position. Heater volts (ac/dc), 6.3; amperes, 1.05.

Characteristics	CLASS A, AMPLIFIER	Unit No.1	Unit No.1 Unit No.2	
Plate Voltage		250	60 175	volts
Grid Voltage		op ;	0 -25 0	volts
Amplification Factor		99	ا د د	
Plate Registance (Approx.)		30000	- 920	opms
Transconductance		2200	0009 -	soum'
Grid Voltage (Approx.):				
For plate current of 20 µa		-D 3	1 ;	NOICE NOICE
For plate current of 200 µs.		1 4	C#45	volts
Plate current.		N	100 40	EU.

VERTICAL-DEFLECTION OSCILLATOR AND AMPLIFIER

For operation in a 525-line, 30-frame system

The same of the sa			
	Unit No.1	Unit No.2	
Meximum Rafings, (Design-Maximum Values):	Oscillator	Amplifier	
DC PLATE VOLTAGE	350 max	550 max	volts
PRAK POSITIVE-PULSE PLATE VOLTAGE	1	1500 max	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	-400 max	-250 max	volts
PEAK CATHODE CURRENT	- max	175 max	ma
AVERAGE CATHODE CURRENT.	- max	20 max	ma
PLATE DISSIPATION	l max	10 max	watts
PEAK HEATER-CATHODE VOLTAGE:		900	
Heater negative with respect to cathode	200 1102	200 max	volts
Heater positive with respect to cathode	200=max	Z00 max	volts
Maximum Circuit Values:			

• The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

The dc component must not exceed 100 volts.

Grid-Circuit Resistance: For grid-resistance-biss operation For exthode-biss operation

1 max megohm 2.2 max megohms

-Technical Data =

SHARP-CUTOFF, PENTODE MEDIUM-MU TRIODE

Miniature type used as combined oscillator and mixer in television receivers utilizing an intermediate frequency in the order of 40 megacycles per second. Outline 8B, OUTLINES

Related types: . SEAS, 19EAS 6EA8

SECTION. Tube requires miniature nine-contact socket and may be mounted in any position.

6.3 volts .45 ampere 11 seconds	ternal hield" 1.7 nf	3.2 pf	1.9 pf	0.01 max pf	5 pí	3 pf
0 %	E S	i es	Ħ			8
Wahout	External Shield	. ==	4.1	0.02 max	מו	61 & 80
Heater Voltage (ac/dc) Heater Current Heater Warm-up Time (Average) Without	DIRECT INTERFLECTRODE CAPACITANCES: Triode Units Triode Units	Grid to Cathode, Heater, Pentode Cathode, Pentode Grid No.3, and Internal Shield	Plate to Cathode, Heater, Pentode Cathode, Pentode Grid No.3, and Internal Shield Cathode to Heater,	Pentode Unit: Grid No.1 to Plate	Grid No.1 to Cathode, Heater, Grid No.2, Grid No.5, and Internal Shield	Plate to Cathode, Heater, Grid No.2, Grid No.4, and Internal Shield Heater to Cathode

With external shield connected to cathode of unit under test except as noted.
 With external shield connected to ground.

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CLASS
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	Triode	Pentode	
Maximum Ratings, (Design-Maximum Values):	Unit	Unit	
Prate Voltage	330 max	330 max	volts
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE.	ľ	330 max	volts
GRID-NO.2 VOLTAGE	1	See curve page 70	page 70
Garp-No.1 (CONTROL GRID) VOLTAGE, Positive-bias value	0 max	0 max	volts
PLATE DISSIPATION	2.5 ma.c	3.1 max	watts
GRID-NO.2 INPUT:		3	:
For grid-No.2 voltages up to 165 volts.	1	0.55 max	watt
For grid-No.2 voltages between 165 and 330 volts	1	See curve page 70	page 70
PRAK HEATER-CATHODE VOLTAGE:	;	4	
Heater negative with respect to cathode	200 max	700 max	volta
Heater positive with respect to cathode	200 max	700 max	volts

· The de component must not exceed 100 volts.

e) AVERAGE PLATE CHARACTERISTICS TRICK INIT TYPE GEAB

247

92CM-9866T

PLATE VOLTS

= Technical Data =

Pentode Unit	125 125	T (20000 6400	건 4 후
Triode Unit	150	9 0	\$000 \$500 \$500	12 -12
Characteristics	Plate Supply Voltage Grid-No.2 Voltage	Grid-No.1 Voltage Cathode-Bias Resistor	Amplification Factor	Plate Current. Grid-No.2 Current Grid-No.1 Voltage for plate current of 10 µa.

volts volts voit obms

obms

mmhos

ma

ma

volts

AVERAGE CHARACTERISTICS PENTODE UNIT

			Γ											L	_		ģ
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				t		1		Ħ		1	Ī		1	j	ו		200 PLATE VOLTS
		-	t	†	-	1		Ħ	T	1	<u>-</u>	1	1	j	ţ	1	200 PLATE
		1	t	1		-1				ď				ľ	ľ	I	_
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			+	-	-	\dashv	 	H	Н	H	_	##	١,	} }	¦;	Ħ	
- :	-	함	+			+	╁	\vdash	۲	TC2	 	ij.	Ť	ĺ	ŀ	Ħ	001
2	<u></u>	GRID-NEI VOLTS ECI=0	+		╢-	-}	╁	┝	H	1	F	1	+	i	ŀ	H	
S V	<u>-</u>	- 5	╁		┞	1	╁	╁	╁	,	\vdash	f	+	H	1	╫	ş
TYPE 6EAS	Į—	+	1	<u> </u>	╞	+	7	+	7		7	Z	∇	۲	H	Щ	

Miniature type used in color and black-and-white television receivers. Pentode unit is used as video output amplifier; triode unit is used in sync-SHARP-CUTOFF PENTODE HIGH-MU TRIODE-

6EB8 Related type:

separator, sync-clipper, and phase-inverter circuits. Outline 8D, OUTLINES SECTION. Tube requires miniature ninecontact socket and may be mounted in any position.

volts ampere	តិគឺធំ	ัสสิส	នីនីនី
6.3	4.2.0 4.4.0 36.0	0.1 max 11 4.2	0.018 max 0.005 max 0.17 max
Heater Voltage (ac/dc). Heater Vortage (ac/dc). Direct Interelectrode Capacitances:	Triode Unit: Grid to Plate. Grid to Cathode and Heater. Plate to Cathode and Heater.	Pentode Unit: Grid No.1 to Plate. Grid No.2, Grid No.2, Grid No.3, and Internal Shield. Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield.	Triode Grid to Pentode Plate Pentode Grid No.1 to Triode Plate Pentode Grid No.1 to Triode Plate Pentode Plate to Triode Plate

LIFIER
AMP
₹
CLASS

Unit	. 330 max	0 max 1 max
Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE. GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE.	GRID-NO.Z VOLTAGE. GRID-NO.I (CONTROLGEID) VOLTAGE, Positive-bias value. PLATE Dissilvation.

Pentode
Unit
330 max volts
330 max volts
0 max volts
0 max volts

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CTE			~		<u>در</u>	[5	ત ન	\$ 60 \$
LAR.			, .		./	/	$\Gamma\Gamma$	VOLT
TE C				2000				300 400 PLATE VOLTS
AVERAGE PLATE CHARACTERISTICS					8/			ĕ
VERAC							\sum	500
•							\prod	Ñ.
	.T.S						\prod	00
	TYPE 6EBB Er=6.3 YOLTS							-
	TYPE E.e.= (
		\$38	139MAI.	N 1714 33	rAuq 0		'n	•

		92CM-9907TI	
GRID-NO.Z AND UVI For grid-No.2 voltages up to 165 volts. For grid-No.2 voltages between 165 and 330 volts.	1-1	1,1 max wat See curve page	wat page
o cathode	200 max 200°max	200 max 200°max	40
	$\Gamma riode \ Unit$	Pentode Unit	
Piste Supply Voltage	250 _	200 125	V V
	ឌា :	1 80	함
	100 37000 2700	75000 19500	ohr
	- iα 1 α 1	1 9 28 5	[] []
Chid-IN 0.2 Cultest,	t	-	=

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0.5 max 1.0 max Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-bias operation. For cathode-bias operation.

megohm megohm

0.25 max 1.0 max

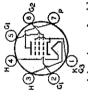
AVERAGE CHARACTERISTICS GRID-Nº LYQLTS ECLES AID -NE | VOLTS ECLED TYPE 6EB8 E.p.=6.3 VOLTS GRD-NE2 VOLTS= 125

249

12CM-9906T

PLATE VOLTS

POWER PENTODE



ŽQ*	af grid- iniature	volts amperes pf pf pf
	gg rith a low equires m	6.3 1.2 0.65 17
Miniature type used in the audio output stage of radio and television receivers and in phonographs. This type has unusually high power sensi-	tivity and is capable of providing rel- atively high power output at low plate and screen-grid voltages with a low af grid- No.1 driving voltage. Outline 7C, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position.	Heaper Voltage (ac/dc) Heaper Current Corrections (Approx.): Grid No.1 to Carbode, Heater, Grid No.2, and Grid No.3 Plate to Cathode, Heater, Grid No.2, and Grid No.3
6EH5 Related types: 12EHS, 25EHS, 50EHS	atively high power on No.1 driving voltage. seven-contact socket	HEATER VOLTAGE (AC/DC) HEATER CURRENT. DIRECT INTERELECTRODE Grid No.1 to Plate. Grid No.1 to Cathode, Plate to Cathode, Hea

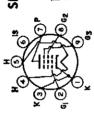
CLASS A ₁ AMPLIFIER		
Maximum Kalings, (Design-Maximum Values): Plarty Voltacis Grip-No.2 (Screen-Grip) Voltage Plarty Dissipation Grip-No.2 Inpur Peak Heater-Cathoby Voltage: Heater Degalive with respect to cathode.	150 max 130 max 5.5 max 2 max 200 max	A A A
Heater positive with respect to cathode. Bulb Temperature (At hottest point)	200 - max 220 max	Š
Pire Supply Voltage Grid-No.2 Supply Voltage Cathode-Bisa Resistor Poat a Ri Crid No. Voltage	110 115 62 3	\$ 5 8 5
Zero-Signal Plate Current. Maximum-Signal Plate Current. Zero-Signal Grid-No.2 Current. Maximum-Signal Grid-No.2 Current. Maximum-Signal Grid-No.2 Current.	42 11.5 14.5 11000	ō
Transconductance (Approx.) Transconductance Total Harmonic Distortion Maximum-Signal Power Output	14600 3000 7 1.4	per c
Maximum Circuit Values: Grid-No.1-Circuit Resistance: For face-bias operation For eathode-bias operation The de component must not exceed 100 volts.	0.1 max 0.5 max	ožew

			t,		7]ئ	٩		160 92CM-9623T
						ļ			o *
				1		1	-		150
AVERAGE CHARACTERISTICS	TYPE 6EH5 E. = 6.3 VOLTS GRID-N2 2 VOLTS=115 OLTS EC.; = 1			+	0,				100 .T\$
CHARAC	0 TYPE 6EH5 EF = 6.3 VOLT GRID-N2 2 VO				£C ±0				80 PLATE VOLTS
AVERAGE	N-diag				- i		V		60
			1		V	V			0.4
			\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			4			20
		S MILLIMILS	S (1) 2	#N -QI	яэ яо 5	(11)	3	W.	5

= Technical Data =

PUSH-PULL CLASS AB, AUDIO-FREQUENCY POWER AMPLIFIER

		volts	volts	ohma	volts	MCI.	BU.	#UB	BE	ohma	per cent	watts	megohm megohm
		140	120	89	4.6	47	51	11	17.7	0009	ď	89. 89.	0.1 max 0.5 max
Maximum Ratings: (Same as for class At audio-frequency power amplifier)	Typical Operation, (Values are for 2 tubes):	Plate Supply Voltage	Grid-No.2 Supply Voltage.	Cathode-Bias Resistor.	Peak AF Grid-No.1 Voltage	Zero-Signal Plate Current.	Maximum-Signal Plate Current.	Zero-Signal Grid-No.2 Current.	Maximum-Signal Grid-No.2 Current	Effective Load Registance (Plate-to-plate)	Total Harmonic Distortion	Maximum-Signal Power Output	Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-bias operation. For cathode-bias operation



oolts atts atts atts oolts

SEMIREMOTE-CUTOFF PENTODE

fier tube in television receivers. Outline 8C, OUTLINES SECTION. Tube be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.3. requires nine-contact socket and may Miniature type used as if-ampli-

6EH7
Related types: 3EH7, 4EH7

Maximum Rafings, (Design-Center Values): 550 maz volts PLATE SUPLY VOLTAGE 20 maz volts GRID-NO.2 (SUPERSOR-CRID) VOLTAGE Positive value 0 maz volts GRID-NO.2 (SUPRESN-GRID) SUPPLY VOLTAGE 550 maz volts GRID-NO.2 INPUT 20 maz volts GRID-NO.2 INPUT 2.5 maz watts PEAK EDISTORION 2.1 NPUT 2.5 maz volts PEAK HEATER-CATHODE VOLTAGE: 150 maz volts Heater negative with respect to cathode 150 maz volts Characteristics Flate Voltage 2.00 volts Grid-No.2 Voltage 2.00 volts 0.5 megobm Transconductance 2.00 volts 0.5 megobm Plate Resistance (Approx.) 1.0 tage 0.5 megobm Transconductance 2.00 2.00 volts Grid-No.2 Current 0.5 2.00 volts Grid-No.2 Supply Voltage Connected to cathode at socket 0.5 ma Grid-No.2 Supply Volta	CLASS	CLASS AT AMPLIFIER				
Volvace Positive value 250 mcz	aximum Ratings, (Design-Center Values):					
250 mazz PPLY VOLTAGE, Positive value 10 mazz 250 mazz 20	LATE SUPPLY VOLTAGE			:	550 ma	
9) VOLTACE, Positive value 500 max 560 max 560 max 560 max 560 max 560 max 560 max 70.00 max 665 max 70.00 max 560 max	LATE VOLTAGE					Ĭ
PPLY VOLTAGE 550 max 250 max 250 max 250 max 250 max 250 max 25 max 350 max 35	RID-NO.3 (SUPPRESSOR-GRID) VOLTAGE, Positi	ve value				
250 max 2 5 max 2 5 max 2 5 max 3 max 3 max 3 max 3 max 3 max 4 ma	RID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE			:		
20 mazz TAGE: 156 mazz Peet to cathode 150 mazz peet to cathode 150 mazz 150 mazz 150 mazz 150 mazz 150 mazz 150 mazz 1500 pu 1200 200 200 200 200 200 200 200 200 2200 2200 200 2200 2200 2200 2200 2200 2200 19.5 626 1250 pu 125 626 12500 pu 185 626 12500 0	GRID-No.2 Voltage.					
### 100	CATHODE CURRENT.			: : : : :	20 ma	
7.7.0E: 2.5 maz pect to cathode 150 maz pect to cathode 200					0.65 ma	
Peet to cathode. 150 mazz peet to cathode . 150 mazz peet to cathode . 150 mazz peet to cathode at second . 150 mazz 200	ATE DISSIPATION			:	2.5 ma	-
pect to cathode 150 maz pect 200 connected 15500 per pect 200 connected 15500 per pect 200 connected 15500 connected 1	AR HEATER-CATHODE VOLTAGE:				;	
Pect to cathode 150 mazz 200 200 200 200 200 200 200 200 200 2	Heater negative with respect to cathode			:::::::::::::::::::::::::::::::::::::::	150 ma	
200 200 -2 -2 0.5 meg 12500 1260 200 200 200 200 200 200	Heater positive with respect to cathode			:	150 ma	
Connected to cathode at st. 200 Connected to cathode at st. 200 Co. 20			:		200	volt
90 20 12500 12500 12500 12500 200 2	:			Connect	ed to catho	le at socke
200 200 200 200 200 C200 C200 C22000 C22000 C22000 C2200 C200 C200 C200 C200 C200 C200 C200 C22000 C	id-No.2 Voltage				90	volt
200 200 200 200 200 200 200 2200 2200	id-No.1 Voltage				~ 1	volt
260 200 200 200 200 Connected to cathode at socket 200 200 200 200 200 22000 2	ate Resistance (Approx.)				0.5	megohn
12 4.5 4.5 200 200 200 200 Connected to cathode at socket 200 22000 22000 22000 -19.5 -9.5 -6.5 -2 125 625 1250 μ cross-modulation 450 160 100 -	ansconductance			:	12500	#mho
200 200 200 200 200 200 200 200 200 200	ate Current.		:		12	Ë
200 200 200 200 200 200 200 Connected to cathode at socket 200 2200 2200 220	id-No.2 Current.			:	4.5	ŭ
200 200 200 200 200 200 200 200 200 200	pical Operation:	4	ć	ě		:
Connected to cander at aborder 200 200 200 200 200 22000 22000 22000 -19.5 -9.5 -6.5 -2 cross-modulation 450 160 100 -	tte Voltage	202	200	200	002	volt
22000 220000 22000	id No.3.	260 260 260 260 260 260 260 260 260 260	200 200	200 at 200	speker 200	voltz
-19.5 -9.5 -6.5 -2 cross-modulation 450 160 100 -	id-No 2 Series Besistor	22000	22000	22000	22000	ohme
. 125 625 1250 µm. . 450 160 100 –	id-No.1 Voltage		-9.5	9-	7	volts
450 160 100 -	ansconductance		625	1250	12500	mh08
	MS Grid-No.1 Voltage, for cross-modulation actor of 0.01	. 450	160	100	(m

ohm ohm

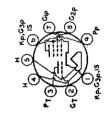
251 megohm

1 max

Maximum Circuit Values: Grid-No.1-Circuit Resistance

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-

Miniature type used as combined oscillator and mixer tube in whi tuners of television receivers having series-connected heater strings. Outline 8B, OUTLINES SECTION. Tube requires nine-contact socket. Heater volts (ac/dc), 6.3; amperes, 0.45; warm-up time (average), 11 seconds. Characteristics as class A. amplifier: plate and grid-No.2 volts, 125 (800 max); grid-No.1 volts, -1(0 max); amplification factor (tri-



ode unit), 40; plate resistance (pentode unit, approx.), 0.17 megohm; transconductance, 7500 µmhos (triode unit), 6000 umhos (pentode unit); plate ma., 13.5 (triode unit), 12 (pentode unit); grid-No.2 ma. (pentode unit), 4; peak beater-cathode volts, 200 maz (the de component must not exceed 100 volts). This type is used principally for renewal purposes.

SHARP-CUTOFF PENTODE

Miniature type used as if-amplifier tube in television receivers. Outline 8C, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position.

Related types: 3EJ7, 4EJ7



Heater volts (ac/dc), 6.3; amperes,0.3.	CLASS A, AMPLIFIER	Design Canter Values).
---	--------------------	------------------------

Maximum Ratings, (Design-Center Values):		
PLATE SUPPLY VOLTAGE.	550	max
PLATE VOLTAGE	250	max
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE	220	max
GRID-No.2 VOLTAGE.		250 max
CATHODE CURRENT.		25 max
GRID-NO.2 INPUT.		0.9 max
PLATE DISSIPATION,		2.5 max
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode		150 max
Heater positive with respect to cathode.		150 max
Other man with the second		

Watts volts volts

ma

volts volts volts watt

190 200 volts Connected to cathode at socket $\frac{-2.6}{0.35}$ 190 -2.35 0.35 15000 Plate Resistance (Approx.)..... Transconductance..... Plate Current. Grid-No.2 Current. Grid-No.1-Circuit Resistance. Plate Voltage..... Grid-No.2 Voltage Maximum Circuit Values: Grid-No.1 Voltage. Characteristics: Grid No.3



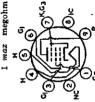
BEAM POWER TUBE

Miniature type used as vertical ceivers utilizing picture tubes having diagonal deflection angles of 110 degrees. Outline 8E, OUTLINES SECdeflection amplifier in television re-

6EM5

Related lype:

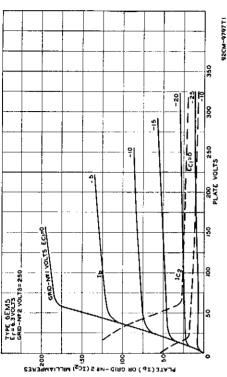
BEMS



TION. Tube requires miniature nine-contact socket and may be mounted in any position.

= Technical Data

AVERAGE CHARACTERISTICS



VERTICAL DEFLECTION AMPLIFIER

For operation in a 525-line, 30-frame system

	volts	volta	volte	volts	BCII	103	watts	watts	volts	volts °C	
	315 max	2200 - max	285 max	-250 max	210 max	60 max	10 max	1.5 max	200 max	200°max 250 max	
Maximum Ratings, (Design-Center Values):	DC PLATE VOLTAGE	PEAK FOSITIVE-FULSE PLATE VOLTAGET (Absolute Maximum)	GRID-NO.Z (SCREEN-GRID) VOLTAGE	Park NEGATIVE-PULSE GRID-NO.1 (CONTROL-GRID) VOLTAGE	FEAR CATHODE CURRENT.	AVERAGE CATHODE CURRENT.	PLATE DISSIPATION	GRID-NO.Z INPUT. PRAK HEATER-CATHODE VOLTACE:	Heater negative with respect to cathode.	Design Positive with Perfect to Cathode. Bulb Temperature (At hottest point)	

Maximum Circuit Values:

Grid-No.1-Circuit Resistance....

† The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a \$25-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

megohm

2.2 max

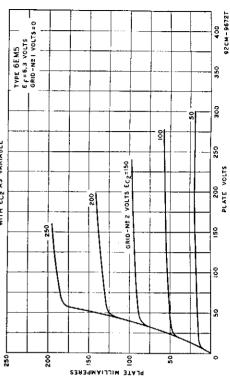
 Under no circumstances should this absolute value be exceeded. The dc component must not exceed 100 volts.

volta volts umbos

ma

megohm

AVERAGE CHARACTERISTICS WITH ECZ AS VARIABLE



Related types: 10EM7, 13EM7 **6EM7**

Glass octal type containing high-

bined vertical-deflection amplifier and mu triode and high-perveance, low-mu triode in same envelope. Used as comvertical-deflection oscillator in tele-

vision receivers employing picture tubes having 110-degree deflection angles and high ultor voltages. Outline 14A, OUTLINES SECTION. Tube requires octal socket and may be mounted in any position. For curve of average plate characteristics, Unit No.1, refer to type 6DR7 (Unit No.1).

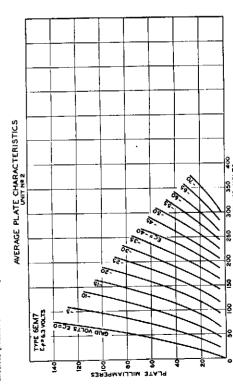
		voits ampere
DIRECT INTERELECTRODE CAPACITANCES (Approx.): Grid to Plate. Grid to Catthode and Heater. Plate to Cathode and Heater. 1.2 Plate to Cathode and Heater. 0.6	1 Unit No.2 10 7 1.8	ją ją
CLASS A, AMPLIFIER		
Characteristics: Unit No.1 Plate Voltage. 250		volts
Grid Voltage Amplification Pactor 64 Disto Besiteened Ammer 9	75.4 750	ohms
Transconductance.	7200	soquar
Grid Voltage (Approx.): For plate current of 10 ps.	-4-5	volts volts
Plate Current.	20	R OM
Plate Current, for plate voltage of 60 volts and zero grid voltage	10	ma
#The duration of the voltage pulse must not exceed 15 per cent of one vertical-scanning cycle. In a 525-	cal-scanning cycle.	In a 525-

The duration of the voltage pulse must not exceed 10 per cent on one vertical scanning cycle is 2.5 milliseconds. line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

■ The dc component must not exceed 100 volts.

VERTICAL-DEFLECTION OSCILLATOR AND AMPLIFIER For operation in a 525-line, 30-frame system

r or operation in a section, soll mire again			
	Unit No.1	Unit No.2	
Maximum Ratings. (Design-Maximum Values):	Oscillator	Amplifier	
	330 max	330 max	volts
DO FLATE VOLLANDE CO.	,	1500 max	volts
PEAK FOSITIVE-FULSE FLATER VOLTAGEF	400	950	4104
PEAK NEGATIVE-PULSE GRID VOLTAGE	702 1004-	100	40104
PEAK CATHODS CURRENT.	The max	TO HEEK	E I
AVERAGE CATHODE CURRENT.	22 max	50 max	108
PLATE DISSIPATION.	1.5 max	TD max	watts
PEAR HEATER-CATHODE VOLTAGE:		000	-
Heater negative with respect to cathode	Z011 max	200 7202	NOI CO
Heater positive with respect to cathode	Z011 max	ZOO Har	Volts



Maximum Circuit Values:

= Technical Data

Grid-Circuit Resistance: Forgid-resistor-bias operation For eathode-bias operation

Unit No.1 2.2 max 2.2 max

Unit No.2 2.2 max megohms 2.2 max megohms

DIODE-REMOTE-CUTOFF PENTODE

[≭]@

Miniature type used as combined if amplifier and AM detector in AM and AM/FM radio receivers. Outline

\] ~		weight in he
() ()	quires miniature nine-contact socket	12EQ7, 20EC
489 4	and may be operated in any position.	
HEATER VOLTAGE (AC/DC)	HEATER VOLTAGE (AC/DC)	e.
HEATER CURRENT	HEATER CURRENT	es.0
DIRECT INTERELECTRODE CAPACITANCES:	CAPACITANCES:	
Pentode Unit:		
Grid No.1 to Plate	Grid No.1 to Plate	0.002 max
Grid No.1 to Cathod	le, Heater, Grid No.2, Grid No.3, and Internal Shield	5.5
Plate to Cathode; He	eater, Grid No.2, Grid No.3, and Internal Shield .	.0
Pentode Grid No.1 to Die	Pentode Grid No.1 to Diode Plate.	0.0015 max
Pentode Plate to Diode F	Pentode Plate to Diode Plate	0.095

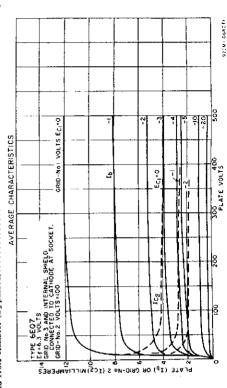
volts ampere

77777 77777

	volts	volts	volts	volts	volts watts watt
	300 max	300 max		0 max	-50 max 3 max 0.2 max
PENTODE UNIT AS CLASS A1 AMPLIFIER Maximum Rafings, (Design-Maximum Volues):	PLATE VOLTAGE.	GRIP-NO.5 (SUPPRESSOR-URID) & OLIAGE. PORITION WILL. Noneting unline	GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE.	GRID-NO.4 VOLTAGE. GRID-NO.1 (CONTROL-GRID) VOLTAGE: Postitus-bias value	Negative-bias value PLATB Dissipation GRID-No.3 IRVIT

ve page 70				P	; watt		watt	rve page 70	
GRID-NO.2 VOLTAGE	,	tomar 	-50 max	3 max	0.2 max	1	For grid-No.2 voltages up to 150 volts.	See cun	
		Positive-bias value.	Negative-bias value	PLATE DISSIPATION.	GRID-NO.3 INPUT				
								nd 300 volts	
	OLTAGE:	• • • • • • • • • • • • • • • • • • • •					to 150 volt	tween 150 a	
三	GRID-NO.1 (CONTROL-GRID) VOLTAGE:	/g/ue,	value	· · · · · · · · · · · · · · · · · · ·			voltages up	voltages be	
IO.2 VOLTAG	IO.1 (CONTR	sitive-bias v	gative-bias	DISSIPATION	10.3 INPUT.	GRID-NO.2 INPUT:	r grid-No.2	r grid-No.2	
GRID	GRID-N	Po	Z	PLATE	GRED	GRID	F	į.	4

volts	volts	le at socket	le at socket	volts	volts	megohms
200 max 200 max 150 max	100	ed to cathod	ed to cathod	100	0	N N
		Connect	Connect			
0						
OLTAGE: respect to cathod espect to cathode ottest point)						sed)
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode. BULB TEMPERATURE (At hottest point).	Characteristics. Plate Voltage	Grid No.3. Connected to cathode at socket	Internal Shield. Connected to cathode at socket	Grid-No.2 Voltage	Grid-No.1 Supply Voltage.	Vo.1 Resistor (Bypas
PEAK B BULB	Chara Plate	Grid	Intern	Grid-1	Grid-1	Grid-L



255

92CM-10466T

megohm µmhos na na volts	
0.25 3800 9 3.5 -20	
Plate Resistance (Approx.). Transconductance Transconductance Transconductance Grid-No.2 Current Grid-No.1 Voltage (Approx.) for transconductance of 40 µmhos.	

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	Maximum Ratings, (Design-Maximum Values):	PLATE CURRENT.
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	Characteristics, Instantaneous Value:	Tube Voltage Drop for plate current of 2 ma.
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The de component must not exceed 100 volts.

HIGH-MU TRIODE

6ER5

Related types: 2ER5, 3ER5

Miniature type with frame grid used in whf tuners of television receivers. Outline 7B, OUTLINES SEC-TION. Tube requires miniature sevencontact socket and may be mounted in any position. Heater volts (ac/dc), 6.3, amperes, 0.18.

CLASS A, AMPLIFIER

		•	20 max			. 100 max			T			2		නර පො	
Maximum Pertinas (Design Tenter Values):	PLATE VOLTAGE	GRID VOLTAGE, Negative-bias value	CATHODE CURRENT.	PLATE LISSIPATION PLANT PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode	Heater positive with respect to cathode	Characteristics	Plate Voltage	Grid Voltage	Amplification Factor	Plate Resistance (Approx.)	Transconductance	Plate Current.	Grid Voltage (Approx.) for transconductance of 500 µmhos	Grid Voltage (Approx.) for transconductance of 100 µmhos

volts volts

voits voits

Watts

ohms µmbos ms volts volts

HIGH-MU TRIODE Grid Circuit Resistance.....

riate Current. Grid Voltage (Approx.) for transconductance of 500 μmhos. Grid Voltage (Approx.) for transconductance of 100 μmhos.

Maximum Circuit Value:

1 max megohm

Miniature type used as groundedcathode rf amplifier in vhf television receivers. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be operated in any position. Heater volts (ac/dc), 6.3; amperes, 0.2.

CLASS A1 AMPLIFIER

į	250 max	o max	25m 77	TOM T. 7	100 000	TOU LOT
Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE	GRID VOLTAGE, Positive-bias value.	CATHODE CURRENT.	FLATE DISSIPATION	PEAK HEATER-CATHOUS VOLIAGE:	Heater negative with respect to cathode

volts volts ma watts

volts volts

volts volt

ATHODE CURRENT.	ATE DISSIPATION		Heater negative with respect to cathode	Heater positive with respect to cathode
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	ភ	MAK HEATER-CATHODE VOLTAGE:	≒	÷
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	5	Ž	_	

ohma µmhos ma volts

9000

megohm

1 max

Maximum Circuit Values: Grid-Circuit Resistance.

€

VARIABLE-MU TWIN TRIODE

= Technical Data =

Miniature type with high transconductance, variable mu, and low noise; used as cascode-type amplifier line 8B, OUTLINES SECTION, Tube in tuners of television receivers. Out-

Related type: 4E58 requires miniature nine-contact socket and may be operated in any position. Heater volts (ac/dc), 6.3; amperes, 0.365.

voita

10

ma

1 max

CLASS A1 AMPLIFIER (Each Unit)

Characteristics:		
Plate Voltage 90 90 Grid Voltage -12 -5 Plate Resistance (Approx.) 2500 - Fransconductance 12500 625 Plate Current. 15 15	90 125 125	volts volts ohms µmhos ms
CASCODE-TYPE AMPLIFIER Maximum Ratings, (Design-Center Values):		
Plate Supely Voltage with plate current of 0 ma. Plate Voltage (Each unit).	550 max 130 max	volts
GRID VOLTAGE, Negative-bias value (Each unit) CATHODE CRRENT (Each unit) PLATE DISSIPATION (Each unit) HEATER-CATHODE VOLTAGE:	_50 max 22 max 1.8 max	volts ma watts
Unit No.1.9 RMS voltage between cathode and heater	50 max	voits
RMS voltage between cathode and heater* DC voltage between cathode and heater*	50 max 130 max	volts
Typical Operation: In a cascode-type circuit with the grid of the Supply Voltage. Supply Voltage divider Plate Ourent. Transconductance Transconductance Original Capture (Approx.) for transconductance of 125 µmhos Input Voltage for proxe-modulation factor of 0.01 and transconductance of 125 µmhos Input Voltage for proxe-modulation factor of 0.01 and transconductance of 125 µmhos	180 12500 6.5 - 9	volts ma mhos db volts mv
Maximum Circuit Values: Grid-Circuit Resistance (Each unit)	1 max	meghom

Grounded-grid output unit—pins 1, 2, and 3. Cathode positive with respect to heater.

 $^{\circ}$ In order not to exceed the maximum-rated plate voltage when the cascode-type amplifier is controlled it is necessary to use a voltage divider for the grid of the grounded-grid output unit.

Measured with tube operating in a television tuner.



HIGH-MU TWIN TRIODE

Miniature type used in high-gain, resistance-coupled, low-level audioamplifier applications where low-hum and non-microphonic characteristics are important considerations, such as

volts ampere graphs. Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact in microphone amplifiers and in preamplifiers for mono- and stereophonic phonosocket and may be mounted in any position. For typical operation as a resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER SECTION. 6 3 3 0.15 HEAFER CURRINT

DIRECT EXTERRIBLETRODE CAPACITANCES (Each Unit, Approx.):
Grid to Plate
Grid to Cathode and Heater
Plate to Cathode and Heater HEATER VOLTAGE (AC/DC)
HEATER CURRENT

1.8 microvolts rms Equivalent Noise And Hum Voltage (Referenced to Grid, Each Unit): Average Value*

A versge vaue*

* Measured in "true rms" units under the following conditions: Heater volts (ac), 6.3; center-tap of heater transformer grounded; plate supply volts, 250; plate load resistor, 100000 ohms; cathode resistor, 2700 ohms; cathode bypass capacitor, 100 μ i; grid resistor, 0 ohms; amplifier frequency range, 25 to 10000 cps.

CLASS A, AMPLIFIER (Each Unit)

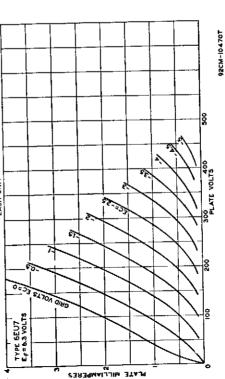
Maximum Ratings, (Design-Maximum Values):	6	4
PLATE VOLTAGE	330 max	VOLLS
GRID VOLTAGE:		a+loss
Negative-bias value	rpm cc-	voits
Positive-bias value.	0 mar	VOILS
PLATE DISSIPATION	1.2 max	Wates
PEAK HEATER-CATHODE VOLTAGE:	000	24101
Heater negative with respect to cathode	Z00 m1x	volts
Heater positive with respect to cathode	200 = max	VOLUS
The dc component must not exceed 100 voits.		

Plate Voltage.....

Characteristics:

ohms 4mhos volts 250 -2 100 62500 1600 1.2 100 -1 100 80000 1250 0.5 Amplification Factor. Plate Resistance (Approx.) Transconductance..... Plate Current..... Grid Voltage

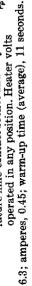
AVERAGE PLATE CHARACTERISTICS EACH UNIT TYPE 6EU7



MEDIUM-MU TRIODE—

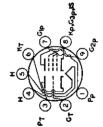
Miniature type used as combined or ③ triode oscillator and pentode mixer in iature nine-contact socket and may be television receivers. Outline 8B, OUT-LINES SECTION. Tube requires min-SHARP-CUTOFF PENTODE

> **6EU8** Related type: **3EU**8



CLASS As AMPLIFIE! Maximum Ratings, (Design-Center Values):	Ratings, $(De$	Maximum
(ac/dc), 6.3; amperes, 0.45; warm-up time (av/dc)	6.3; ampe	(ac/dc),

	Triode	Pentode	
Maximum Ratings. (Design-Center Values):	Unit	Unit	
PLATE VOLTAGE	330 max	330~max	volts
GRIPNO.2 (SCREEN-GRID) SUPPLY VOLTAGE	1	330 max	volts
GRIPNO.2 VOLTAGE.		See curve page 70	page 70
GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	max 0	0 max	volts
PLATE DISSIPATION.	3 11102	3.1 max	watts



HIGH-MU TWIN TRIODE

0.5 max megohm

control tube in remote-control tuning units of television receivers. It is processed specifically for operation under Miniature type used as a relaystandby conditions. Outline 8D, OUT-(B) KT1 (C)

672(E)

LINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. ©^z

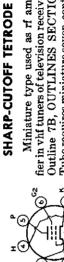
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GBID-No.2 Input: For grid-No.2 voltages up to 165 volts. For grid-No.2 voltages between 165 and 330 volts.	1	0.55 max See curve	55 max watt See curve page 70
PEAK HEATER—CATHOUS VOLVED. Heater negative with respect to cathode. Heater positive with respect to cathode.	200 max 200°max	200 max 200°max	volts volts
Characteristics			
Plate Supply Voltage.	150	125	volts
Grid-No.2 Supply Voltage	ļ	125	volts
Grid-No.1 Voltage	1	7	volt
Cathode-Bias Resistor	26	ı	ohros
Amplification Factor	40	1 ;	
Plate Resistance (Approx.)	2000	80000	ohras
Transconductance	8500	6400	#rahos
Grid-No.1 Voltage (Approx.) for plate current of 10 µa	-12	6î 	volts
Plate Current	8	12	ma
Grid-No.2 Current	ı	4	ELLE
Cathode Warm-up Time"	32	1	seconds
Maximum Circuit Values:			

■ The cathode warm-up time is defined as the time required for the transconductance to reach 6500 µmbos when the tube is operated from a cold start with de plate volts=100, grid volts=0, and heater volts=5.5.

0.1 max megohm

0.1 max



H

Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be operated in any position. Heater volts (ac/dc), 6.3; Miniature type used as rf amplifier in whi tuners of television receivers. amperes, 0.2.

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Maximum Values):

275 max volts 180 max volts See curve page 70 0 max volts 20 max ma	0.2 max watt See curve page 70 3.25 max watts	100 max volts 100° max volts
PLATE VOLTAGE. GRID-NO 2 (SGRERN-GRID) SUPPLY VOLTAGE. GRID-NO 2 VOLTAGE. GRID-NO 1 (CONTAGE.) For grid-No.2 voltages up to 90 volts For grid-No.2 voltages between 90 and 180 volts FARE DISSIRATION DEAY HEARE-CAUTHORY VO. W.C.E.	Heater negative with respect to cathode. Heater positive with respect to cathode.	

Characteristics:

Plate Voltage. Grid-No. 20 diage. Grid-No. 20 diage.	250 80	volts volts
Plate Resistance (Approx.)	0.15	Megohm
Transconductance. Plate Current.	8800 11.5	#mhos
Grid-No 2 Current. Grid-No.1 Voltage (Approx.) for transconductance of 100 µmhos.	0.0 0.0 0.0	roa volts
Maximum Circuit Value:		

259

PLATE DISSIPATION.

volts ampere pf pf	volts volts ohms umhos ma
Heater Voltage (AC/DC) 6.3 6.3 6.6 8.6 Direct Interest Carlo Capacitances (Approx.): Unit No.! Unit No.? Grid to Plate and Heater 3.4 Flate to Cathode and Heater 0.33 Plate to Cathode and Heater 0.23	Characteristics: CLASS A, AMPLIFIER (Each Unit) 250 Plate Voltage -2 -2 Grid Voltage 60 60 Amplification Factor 11500 11500 Plate Resistance (Approx.) 5200 9.2 Flate Current. 9.2 9.2 Grid Voltage (Approx.) for plate current of 100 µa -9
HEATER VOLTAG HEATER CURREN DIRECT INTEREL Grid to Platt Grid to Catl Plate to Cat	Characteristics: Plate Voltage Grid Voltage Amplification Faramsconductan Transconductan Plate Current Grid Voltage (A.

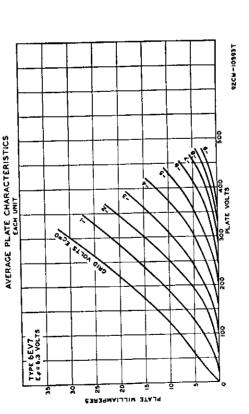
RELAY-CONTROL SERVICE (Each Unit)

Maximum Ratings, (Design-Maximum Values):		300 2002	volts
PLATE VOLTAGE GRID VOLTAGE, Positive-bias value Campor Cirrer Pro-		0 max 20 max	volts
IE DISSIPATION: When "on" time exceeds 30 seconds in any 2-minute interval. When "on" time does not exceed 30 seconds in any 2-minute interval. When "on" time does not exceed 30 seconds in any 2-minute interval.	terval	2.5 max 4.5 max	watts watts
PEAK HEATER-CATHODE VOLTAGE: HEAGEN regative with respect to cathode Heater positive with respect to cathode. The dc component must not exceed 100 volts.		200 max 200 max	volts volts
Typical Operation with 2500-Ohm-Relay Load: With "on" time in any 2-minute interval: Plate Supply Voltage. Supply Voltage Current. Grid Voltage (Approx.) for plate current of 100 µa.	30 seconds or less 250 18,5 -9	More than 30 seconds 150 10 -5	volts ma volts

3.9 max Grid-Circuit Resistance.

Maximum Circuit Value:

megohms



SHARP-CUTOFF PENTODE

Related types: 4EW5, 5EW6 **6EW6**

evision receivers operating at an intermediate frequency in the order of 40 megacycles per second. This tube fea-Miniature type used in the gaincontrolled picture-if stages of whf tel-

tures controlled plate-current cutoff and high transconductance (14000 µmhos)

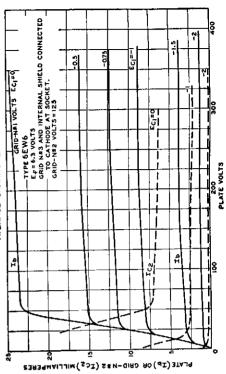
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combined with low interelectrode capacitance values. The 6EW6 is provided with separate base pins for grid No.3 and cathode to permit the use of an unbypassed cathode resistor to minimize changes in input conductance and input capacitance with bias, without causing oscillation. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position.

AC/DC) 6.3 volts ampere 0.4 ampere	Withoul With External External Shield Shteld*	No.2. Grid No.3 and	Internal Shield.	ode, neater, Grid in o.z., Grid in o.z., and 2,4 3.4 pf	CLASS A, AMPUFIER	66	**	330 max	RID) SUPPLY VOLTAGESupply VOLTAGE.	GRID) VOLTAGE Positive-bigs value	က		voltages up to 165 volts.	For grid-No.2 voltages between 165 and 330 volta	Heater merative with respect to cathode	forter notified with respect to rethods		age volts	ected to cathode at so	125 ected to cathode at so 125	125 Connected to cathode at st	125 ected to cathode at 125 56 0.2 m	125 ected to cathode at se 125 66 0.2 mee 14000 µ	125 ected to cathode at 125 56 0.2 m 14000	. 125 ected to cathode at 125 66 0.2 m 14000 -3.5	ected to cathode at 125	125 ected to cathode at 125 56 0.2 m 14000 -3.5
HEATER VOLTAGE (AC/DC)	DIRECT INTERELECTRODE CAPACITANCES:	Grid No.1 to Plate	Internal Shield.	Flare to Cathode, fleater, fle		Maximum Kahngs, (Design-Maximum Values):	PLATE VOLTAGE.	GRID NO.3 (SUPPRESSOR-GRID)	GRID-NO.Z (SCREEN-GRID) SUPP	GRID-NO.2 VOLTAGE	PLATE DISSIPATION	GRID-NO.2 INPUT:	For grid-No.2 voltages up to 165 volts.	For grid-No.2 voltages between DEAN HEATER-CATHODS VOLTAGE:	Heater negative with respe	Heater positive with respe	Characteristics	Characteristics:	Characteristics: Plate Supply Voltage. Grid No.3	Characteristics: Plate Supply Voltage. Grid No.3 Grid-No.2 Supply Voltage.	Characteristics: Plate Supply Voltage. Grid No.3. Grid-No.8 Supply Voltage. Cathorle-Bias Resistor	Characteristics: Plate Supply Voltage. Grid No.3. Grid-No.2 Supply Voltage. Cathode-Bias Resistor. Plate Resistance (Approx.).	Characteristics: Plate Supply Voltage. Grid No.3 Grid-No.2 Supply Voltage. Cathode-Bias Resistor Plate Resistance (Approx.). Transconductance	Characteristics: Plate Supply Voltage. Grid No.3 Grid-No.2 Supply Voltage. Cathode-Bias Resistor. Plate Resistance (Approx.). Transconductance. Grid-No.1 Voltage (Approx.)	Characteristics. Plate Supply Voltage. Grid No.3 Grid-No.2 Supply Voltage. Cathode-Bias Resistor. Plate Resistance (Approx.). Transconductance. Grid-No.1 Voltage (Approx.) Plate Current.	Characteristics: Grid No.3 Grid-No.2 Flate Resistance (Approx.) Fransconductance Grid-No.1 Flate Current.	Characteristics: Plate Supply Voltage. Grid-No.2 Supply Voltage. Grid-No.2 Supply Voltage. Cathode-Bias Resistor. Plate Resistance (Approx.). Transconductance. Grid-No.1 Voltage (Approx.) Flate Current. Grid-No.1 Voltage (Approx.) Grid-No.2 Current.

AVERAGE CHARACTERISTICS

The dc component must not exceed 100 volts. * With external shield connected to cathode.

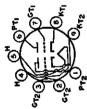


92CM-9965Tf

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DUAL TRIODE

Neonoval type used as combined



OEW /	vertical-deflection oscillator and vertical-deflection amplifier in television created and receivers. Outline 11B, OUTLINES Pression SECTION. Tube requires neonoval	ti- on cr2 ES rai rai	Cr. Curve of average	Okti Ktz Yerage
plate characteristic	plate characteristics, Unit No.1, refer to type 6DE7 (Unit No.1).	nit No.1)		•
HEATER VOLTAGE (AC/DC) HEATER CURRENT	Heater Voltage (ac/dc). Heater Current		6.9 0.9	volts ampere
DIRECT INTERELECTRODE CAPAC Grid to Plate. Grid to Cathode and Heater Plate to Cathode and Heater	PACITANCES (Approx.):	Unit No.1 4.2 2.2 0.4	Unit No.2 9 7 1.2	d H
Characteristics: Plate Voltage Grid Voltage Amplification Factor		Unit No.1 250 -11 17.5		volts volts
Plate Resistance (Appr. Transconductance	ox.) for plate current of 10 µa for plate current of 100 µa voltage of 60 volts and zero grid voltage voltage of -25 volts	0.00 0.00 0.00 0.00 1.00 1.00 1.00 1.00	7500 1 40 1 45 95 8	umhos volts volts ms ms

VERTICAL-DEFLECTION OSCILLATOR AND AMPLIFIER For operation in a 525-line, 30-frame system

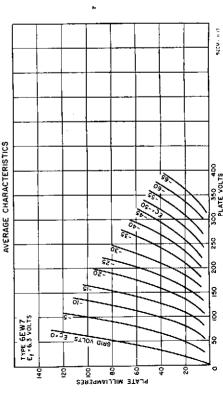
Unit No. 1 Unit No. 2	Oscillator Amplifier	330 max 330 max volts	_ 1500 max	-400 max -250 max	77 max 1	22 max 50 max		200 max 200 max volts 200*max 200*max volts
	Maximum Ratings, (Design-Maximum Values):	DC PLATE VOLTAGE	PRAK PORTIVE PITSE PLATE VOLTAGE	PRAK NEGATIVE PILISE GRID VOLTAGE.	PRAK CATHODE CIRRENT	AVERAGE CATHODE CUBRENT.	PLATE DISBIPATION.	Ррак Неатек-Сатнорв Vol.rage: Heater negative with respect to cathode. Heater negitive with respect to cathode.

2.2 max 2.2 max Grid-Circuit Resistance: For cathode-bias operation. For grid-resistor-bias operation. Maximum Circuit Values:

2.2 max megohms 2.2 max megohms

* The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

AVERAGE CHARACTERISTICS The dc component must not exceed 100 volts.



= Technical Data

BEAM POWER TUBE

peres, 2.25. Characteristics as class A₁ amplifier: plate and grid-No.2 volts, 175; grid-No.1 volts, -30; triode amplification factor, 4.2; socket and should be operated vertically (base down or up) or horizontally with pins 2 and 7 in a vertical plane. Heater volts (ac/dc) 6.3; am-Glassoctal type used as horizontal deflection amplifier in television receivers. Outline 25A, OUTLINES SECTION. Tube requires octal

Related type: 21EX6

plate volts, 7000 max; peak negative-pulse plate volts, ~1500 max; dc grid-No.2 volts, 195 max; peak negative-pulse grid-No.1 volts, ~220 max; cathode ma., 770 max (peak), 220 max (average); plate dissipation, 22 max watts; grid-No.2 input, 3.5 max watts; peak heater-cathode volts, 200 max (the dc component must not exceed 100 volts). This type is used principally for renewal purposes. 3.3. Maximum ratings as horizontal-deflection amplifier: dc plate volts, 770 max; peak positive-pulse plate resistance (approx.), 8500 ohms; transconductance, 7700 µmhos; plate ma., 67; grid-No.2 ma.,



BEAM POWER TUBE

Glass octal type used as vertical deflection amplifier in television receivers. Outline 14E, OUTLINES SECTION. Tube requires octal socket and may be operated in any position. Heatervolts (ac/dc), 6.3; amperes, 0.68.

Related type: 7EY6

CLASS A, AMPLIFIER

250 volts 250 volts 250 volts 60000 μmin 4400 μmin 441 ma 3 ma	350 max volts 350 max volts 300 max volts -250 max volts 180 max na 60 max na 11 max watts	200 max volts 200 max volts 200 max volts 1 max megohm 2.2 max megohm in that the maximum scanning cycle. In a
250 250 0 0 158 21	MPUIFER)-frame eystem	scurrent waveform sue er cent of one vertica ning cycle is 2.5 milli
Characteristics: Prate Voltage Grid-No.2 Voltage Grid-No.1 Voltage Transconductance Grid-No.1 Voltage Grid-No.1 Voltage (Approx.) Frace Resistance Grid-No.2 Voltage (Approx.) Frace Resistance Grid-No.2 Current. Grid-No.2 Current.	VERTICAL DEFLECTION AMPLIFER For operation in a 525-line, 30-frame system Maximum Rahings, (Design-Maximum Values). DC PLATE VOLTAGE PEAK POSITIVE-TUSE FLATE VOLTAGE PEAK NEGRITIVE-TUSE FLATE VOLTAGE PEAK NEGRITIVE-TUSE GRID-NO.1 (CONTROL-GRID) VOLTAGE PEAK CATHODE CURRENT PEAK CATHODE CURRENT PEAK CATHODE CURRENT PEAK CATHODE CURRENT PEAK OF THE DISSIPATION CONTROL GRID-NO.2 INPUT.	Heater negative with respect to cathode Heater positive with respect to cathode Build Temperature (200 max volus Grid-No.1-Circuit Volues: Grid-No.1-Circuit Resistance: For fixed-bias operation For fixed-bias operation This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded. The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a \$55-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds. The de component must not exceed 100 volts.

BEAM POWER TUBE

deflection amplifier in television receivers. Outline 14E, OUTLINES SECTION. Tube requires octal socket Glass octal type used as vertical and may be operated in any position. Heater volts (ac/dc), 6.3; amperes, 0.8.

920M - II IT

CLASS A: AMPLIFIER

Characteristics:

>	>	>	7	111	>		
250	250	02	20000	4100	- 20		o. 5
9	250	0.	1	I	1 3	180	0.7
Plate Voltage	Grid-No.2 Voltage	Grid-No.1 Voltage	Plate Resistance (Approx.)	Transconductance	Grid-No.1 Voltage (Approx.) for plate current of 100 µa	Plate Current.	Grid-No.2 Current,

volts
volts
nhos
rolts
nhos
ma

9

5

VERTICAL DEFLECTION AMPLIFIER

For operation in a 525-line, 30-frame system

Maximum Ratings, (Design-Maximum Values): DC Plate Voltage PEAR FORTIVE-PULSE PLATE VOLTAGE GRID-NO.2 (SCHERE-GRID) VOLTAGE FEAK NEGATIVE-PULSE GRID-NO.1 (CONTROL-GRID) VOLTAGE PEAK CATHODE CURRENT AVERAGE CATHODE CURRENT AVERAGE CATHODE CURRENT BATE DISSIGNTION GRID-NO.2 INFUT PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode Heater positive with respect to cathode
BULB TEMPERATURE (At hottest point)

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:
For fixed-bias operation....
For cathode-bias operation...

megohm megohma

1 max 2.2 max

This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

• The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.
■ The dc component must not exceed 100 volts.

HIGH-MU TRIPLE TRIODE

mixer and afc service in FM receivers. [73(3) Tube requires miniature nine-contact $\mathfrak{s}_{\mathsf{r}_3}$ Miniature type used in oscillatorsocket and may be operated in any position. Heater volts (ac/dc), 6.3; am-Outline 8B, OUTLINES SECTION. peres, 0.45.

CLASS As AMPLIFIER (Each Unit Unless Otherwise Specified)

ux volts	ix volts ix volts ix watts ix watts	ux voits	volts volt ohms µmbtos volts ma
330 max	-50 max 0 max 2 max 5 max	100 max 100 max	125 1 57 13600 4200 -4
Maximum Ratings, (Derign-Maximum Values): Plate Voltage	UNID TOLIANS. Negative-bias value Positive-bias value PLATE Dissipation (All plates) Heaver Control of the cont	Heater negative with respect to cathode. Heater positive with respect to cathode.	Characteristics: Plate Voltage Grid Voltage Grid Voltage Transconductance Grid Voltage (Approx.) Plate Resistance (Approx.) Grid Voltage (Approx.) for plate current of 20 µa.

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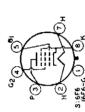
HIGH-MU TRIODE

LINES SECTION. Tubes require octal socket and may be mounted in any position. Type 6F5-GT may be supplied with pin No.1 omitted. Metal type 6F5 and glass octal type 6F5-GT used in resistance-coupled amplifier circuits. Outlines 3 and 15A, respectively, OUT-

6F5GT Related type: 12F5GT

nversible.

Heater volts ac/dci, 6.3; amperes, 0.3.Typical operation as class A: amplifier: plate volts, 250 (300 max); grid volts, -2; amplification factor, 100; plate resistance (approx.), 66000 ohms; transconductance, 1500 µhmos; plate ma., 0.9. Peak heater-cathode volts, 90 max. Type 6F5-GT is a DISCONTINUED type listed for reference only. Type 6F5 is used principally for renewal purposes.



watts

200 max 200 max 200 max

350 max 300 max 300 max -250 max 75 max 12 max 2.75 max

POWER PENTODE

types 6F6-G and 6F6-GT used in the Tubes are capable of large power outaudio output stage of ac receivers. Metal type 6F6 and glass octal

6F6GT 6F6G **6F6**

Outlines 5, 26, and 14E, respectively, OUTLINES SECTION. Type 6F6-GT may be supplied with pin No.1 omitted. Tubes require octal socket and may be mounted in any position. It is especially important that these tubes, like other powerhandling tubes, be adequately ventilated. Types 6F6-G and 6F6-GT are used principally for renewal purposes. Heater volts (ac/dc), 6.3; amperes, 0.7. put with relatively small input voltage.

לייטיישיל ול פפליט				
Maximum Ratings, (Design-Center Values):		Pentode Connection	Triode Connection*	
PLATE VOLTAGE	:	375 max	350 max	volts
RID-NO.2 (SCREEN-GRID) VOLTAGE	:	285 mar		volts
PLATE DISSIPATION	:	11 max	10 mar	Watts
GRID-No.2 Input.	:	3.75 max	ı	watts
EAK HEATER-CATHODE VOLTAGE:		90	00	4100
Heater positive with respect to cathode		90 max	90 max	volts
	Pen	Pentode	Triode	
Typical Operation:	Connection		Connection.	
Plate Voltage	250	285	250	Volts
	250	285		volts
Grid-No.1 (Control-Grid) Voltage	-16.5	-20	-20	volts
	16.5	8	20	volts
	34	38	31	ma
Maximum-Signal Plate Current.	36	40	34	ma
ero-Signal Grid-No.2 Current.	e.	7	I	TB:3
Maximum-Signal Grid-No.2 Current.	10.5	13	ı	ma
	1	1	80.99	
Plate Resistance (Approx.)	80000	78000	2600	ohms
Transconductance	2500	2550	2600	soume
Load Resistance	7000	1000	4000	ohms
Total Harmonic Distortion	œ	o.	6.5	per cent
Maximum-Signal Power Output	89 75	० ० च	0,85	Watts

PUSH-PULL CLASS A, AMPLIFIER

Maximum Ratings: (Same as for class A ₁ ampliffer)	Typical Operation (Values are for two tubes):	Plate Voltage	-No.2 Voltage.	Grid-No.1 (Control-Grid) Voltage	Peak AF Grid-No.1-to-Grid-No.1 Voltage	Zero-Signal Plate Current.	imum-Signal Plate Current	Zero-Signal Grid-No.2 Current	Maximum-Signal Grid-No.2 Current	Effective Load Resistance (Plate-to-plate)	Total Harmonic Distortion	Maximum-Signal Power Output
Maximum	Typical Op	Plate Volta	Grid-No.2	Grid-No.1	Peak AF G	Zero-Signal	Maximum-	Zero-Signa	Maximum-	Effective L	Total Harn	Maximum-

per cent watts

volts volts volts volts ma ma ma ma

2884. 288. 288. 288. 298. 208. 208.

19.5

peration s operation. esistance:

ed to plate.

REMOTE-CUTOFF PENTODE LOW-MU TRIODE-

Glass type adaptable to circuit design in several ways. Outline 24B, OUTLINES SECTION. Heater volts (ac/dc), 6.3; amperes, 0.3. ohm; transconductance, 1100 nmbos; plate ma., 6.5; grid-No.2 ma., 1.5; triode unit - plate volts, Typical operation as class A, amplifier: pentode unit -plate volts, 250 max; grid-No.2 volts, 100; grid-No.1 volts, -3; plate resistance, 0.85 meg-

-3; amplification factor, 8; plate resistance, 0.016 megohm; transconductance, 500 1,5. This type is used principally for renewal purposes.

MEDIUM-MU TWIN TRIODE

or phase inverter in radio equipment. Outline 23, OUTILINES SECTION. Tube requires octal socket. Except for the heater rating of 6.3 volts (ac/dc) and 0.6 ampere and interelectrode capacitances, each triode unit is identical electrically with type 6J5. Type 6F8-G is used prin-Glass octal type used as voltage amplifier cipally for renewal purposes.

DIODE-SHARP-CUTOFF, TWIN-PLATE TETRODE

divider and complex-wave generator circuits of electronic musical instruments. Outline 8D, OUTLINES SEC-TION. Tube requires miniature nine-Miniature type used in frequencycontact socket and may be operated in any position.



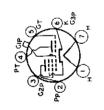
Cathode, Heater, Grid No.2, and Internal Shield thode, Heater, Grid No.2 athode, Heater, Grid No.2, and Internal Shield I to Diode Plate o Diode Plate o Diode Plate. Plate A. Plate B.

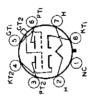
CLASS A, AMPLIFIER

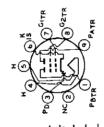
1 1 1 1 1 1 1 1 1 1
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nt.

megohm megohm 0.1 max 0.5 max







volts ampere	គឺគឺគឺគឺ គឺ	i i i
8 9 0	0.040 0.030 max 5.5 1.8 1.8	0.022 0.020 max 0.055
1.0		1 1 1

megohms ohms µmhos ohms 4mhos megohms

E

volts volts volts

= Technical Data =

FREQUENCY DIVIDER & COMPLEX-WAVE GENERATOR

Tetrode Unit Maximum Ratings, (Design-Maximum Values):

Property A Voltage	330 mar	volts
PLATE-B VOLTAGE.	330 max	volts
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE.	330 max	volts
GRID-No.2 Voltage	See curv	See curve page 70
GRID-NO.1 (CONTROL-GRID) VOLTAGE:		
Negative-bias value	-50 max	volts
Positive-bias value.	0 max	volte
PLATE-A DISSIPATION	1.5 max	watte
PLATE-B DISSIPATION.	1.5 max	watts
GRID-NO.2 INPUT:		
For grid-No.2 voltages up to 165 volts	0.65 max	Wati
For grid-No.2 voltages between 165 and 330 volts	See curv	See curve page 70
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max	volts
Heater positive with respect to cathode	200"max	volts
Maximum Circuit Values:		
Gud-No I Circuit Registance		
Willy For original registor-hise operation	2.2 max megohm	mezohm
FOI BLIGHT ACRES OF THE CONTRACTOR OF THE CONTRA		•
Diode Unit		
Maximum Ratings, (Design-Maximum Values):		
PLATE CURRENT	1 max	Ē
1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -		
f 2 ma	10	volt
The server of the total frame continues of the continues		
The dc component must not exceed 100 volts.		

2

4.0

				A COLOR MANAGEMENT
,			-2.5	200
80		50	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	004
	75 EG. 0		1	300
TYPE 6FA7 E1-6.3 VOLTS GRID-NO.2 VOLTS-100 PLATE A CONIECTED TO PLATE B.	- GRID NO I VOLTS EG.* 0		0.03 1.1	500
747 70LTS 1.2 VOLTS = 101	1	No. of	150	0
L I	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	102		

DUAL TRIODE

sion receivers. Maximum dimensions: and low-mu triode units used as com-Okn bined vertical-deflection oscillator and Glass type containing high-mu vertical-deflection amplifier in televi-Š.

6FD7 Related type: 13FD7 over-all length, 2.9 inches; seated height, 2.62 inches; diameter, 1.188 inches. Tube requires miniature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.925.

CLASS A: AMPLIFIER

		5 volts		800 opms	90 mmpos
Unit No	60 150	0 -17.5	1	æ l	1500
Unit No. 1 Unit No. 2	250	6 7	43	4	1600
Characteristics:	Plate Voltage.	Grid Voltage	Amplification Factor	Plate Resistance (Approx.)	Transconductance

267

ma	volts volts µmhos ma	
40	40 500 6	
1.4 955 40	1 1 1 1	
1.4	تن ت ۱ ۱ ۱	
Plate Current	Grid Voltage (Approx.): For plate current of 10 µa. For plate current of 100 µa. Transconductance, for plate current of 1 ma. Plate Current, for grid voltage of -25 volts.	

VERTICAL-DEFLECTION OSCILLATOR AND AMPLIFIER

Lor operation in a secret, contraction			
	Unit No. 1	Unit No. 1 Unit No. 2	
O-11. (Design-Marimum Values):	Oscillator	Amplifier	
Lamba, Leady and Market and Marke	120 mar	330 max	
P. Voltage	200		

	Unit No. 1	Unit No. 1 Onit No. 2	
Deline (Design Marimum Values):	Oscillator	Amplifter	
WOXIMAM Konngs, (Designation of the property o	330 max	330 max	volts
DC PLATE VOLTAGE	i i	1500 max	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE	-400	-250 max	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE	70 200	175 max	ma
PEAK CATHODE CURRENT	00 mm	50 max	ma
AVERAGE CATHODE CURRENT	7011 9	10 max	watts
PLATE DISSIPATION	r o illustration	2	
PEAK HEATER-CATHODE VOLTAGE:	000	200 max	volts
Heater negative with respect to cathode	2000 2007	200 mar	volts
Heater positive with respect to cathode	700 - mar		

Maximum Circuit Values:

Grid-Circuit Resistance:

2.2 max megohms D. This value can be measured by a method involving a recurrent waveform such that the maximum 2.2 max For grid-resistor-bias or cathode-bias operation....

■ The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a \$525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

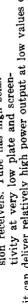
• The dc component must not exceed 100 volts. ratings of the tube will not be exceeded.

BEAM POWER TUBE

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6FE5 Related type: **50FE5**

phonographs and in radio and television receivers. Tube has high sensioutput stages of compact stereophonic Glass octal type used in the audio



grid voltages; it can deliver relatively high power output at low values of plate load resistance. Outline 14F, OUTLINES SECTION. Tube requires octal socket and may be mounted in any position.

amperes 0.44 15 9 HEATER VOLTAGE (AC/DC)...... HEATER CURRENT.
DIRECT INTERFLECTRODE CAPACITANCES (Approx.):

volts

p g g

CLASS A, AMPLIFIER

volts	volts watts watts	voits volts
175 mar	175 max 2.4 max 14.5 max	300 max 200 ™max
Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE. GRID-NO.2 (SCREEN-GRID) VOLTAGE. GRID-NO.2 LNEUT	Plate Dissipation Plate Hearth Grando Voltage Hearth negative with respect to cathode Hearth positive with respect to cathode

GRID-NO.2 Input.	14.5 max	watts	
PEAK HEATER-CATHODE VOLTAGE:	300 max	voits	
Heater negative with respect to cathode	200 max	volts	
Fixed Bios	Cathode Bias		
130 145	130 145	volts	
130 145	130 145	volts	
-	1	voits	
	120 150	ohms	
12.5 15 1	11.9 15.4	volts	
82 80	88 86	ហន	
94 100	98 06	ma	
	5 4.2	ma	
Zero-Signal Grid-No.2 Cultering	9 17	ma	
1	- 0008	ohms	
Title Treatment of the			

= Technical Data

			-					1	umhos ohms per cent watts
	-			0.2	06	25		200 220 240 92CM-10405T	1000 1000 15 10 13 5.6 8.5 4.8
	051	521	001	00 00 00 00 00 00 00 00 00 00 00 00 00				60 100 120 140 160 180 PLATE VOLTS	1000 122 4. 2
400 TYPE 6FES EF & 3 VOLTS = 0		\$71	3dMY(7)	000 71m 31	 001		1	0 20 40 60	Transconductance Load Reisitance Yetal Harmonic Discortion Maximum-Signal Power Output.

PUSH-PULL CLASS A, AMPLIFIER

Maximum Ratings: (Same as for class A₁ amplifier)

Typical Operation (Values are for two tubes):

voits]4	STICA ACIES	ohms	at loss	ACIES	ma	Ē		EUS.	1	2112	ohme		per cent	0+1044	***	
145		140	16	0 00	0.07	160	179	1	**	ç	27	1600		9	9	9.0	
130		130	75		20.07	150	2				-7	1600		င	1	_	
Dist. Ourselve Wolfern	Light arthority voltage	Call A Conner Voltage		Cathode-Dias resistor	Post: AF Crid-No. 1-to-Grid-No. 1 Voltage	Zone Signal Plate Current	Telloring a part of the control of t	Maximum-Signal Flate Current	Tone Girnal Caid No 9 Correspont	Zero-Stgual Gild-19012 Carrent	Maximum-Signal Crid-No.2 Current	The state of the s	Firective Load registance (rightero-place)	Total Harmonic Distortion		Maximum-Signal Power Output.	

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: For fixed-bias operation For exthode-bias operation

megohm

0.1 max 0.5 max

AVERAGE CHARACTERISTICS The dc component must not exceed 100 volts.

								920A-10416T
		CAND_MRIZVOLTS ECI= 0		•	2	SIT	2,	 00 120 MG 160 180 PLATE VOLTS
TYPE 6FE5 E4=6.3 VOLTS GAID-N*2 VOLTS* 125	Se 343	000EM413	1 NICS NICS	SN - O		8	1	20 40

269

268

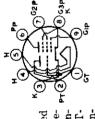
Refer to type EM84/6FG5

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

Related type: 5FG7

oscillator and mixer tube in vhf television receivers employing series-connected heater strings. Outline 8B, OUT. LINESSECTION. Tube requires min-

Miniature type used as combined



jature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.45; warm-up time (average), 11 seconds.

CLASS A, AMPLIFIER

	Tr	Triode	Pentode	ode
Marinum Defines (Design-Maximum Values):	Unil	nil	Unit	,i,
WEXIMON NAME OF THE PARTY OF TH	330	330 max	330 max	max
PLATE VOLTAGE.	1		330 mar	max
GKIJYNOLG (SCREEN TANES) COLUMN COLUM	ı		3 3	See curve
GRID-NO.2 VOLIAGE. GRID) VOLTAGE, Positive-bias value.	0	0 max	٥	0 тах
GRID-NO.2 INPUT:			0 55 mar	1.000
For grid-No.2 voltages up to 165 volts			9	Soo curve
For grid-No.2 voltages between 165 and 350 volts.			, c	1
PLATE DISSIPATION	. N	Z.3 7882	¢	THOM: O
PEAK HEATER-CATHODE VOLTAGE:	200	200 mar	200	200 max
Heater negative with respect to cathode	200	$200 max^{\circ}$	200	200 max
Characteristics			;	Š
	125		100	97.
Plate Voltage	1		100 125	125
Grid-No.2 Voltage	-		0	7
Grid-No.1 Voltage	43		,	;
Amplification Factor.	5700		-180000	0000
Plate Resistance (Approx.)	7500		7400 6000	8000
Transconductance	13		- 11	11
Plate Current.				4
Grid-No.2 Current	6.5		i	5
Grid-No.1 Voltage (Applicate) for printing				

HIGH-MU TRIODE . The dc component must not exceed 100 volts.

Miniature type used as an rf am-

ceivers. Outline 7B, OUTLINES SECTION. Tube requires seven-contact socket and may be mounted in plifier in whf tuners of television re-Related types 2FH5, 3FH5

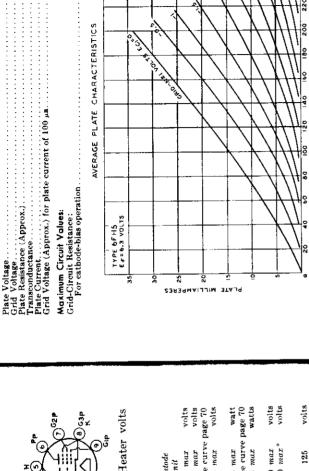
	any position.	Ž	ደ	SIC	9										
HEATER VOLTAGE (AC'DC)	: 6	:	:	:	:		:	:	ì	÷	:	•	:	:	:
HEATER CURRENT		:	:	÷	ì	:	÷	ì	:	:	:	:	:	: ;	: •
													Ξď	Without	<u> </u>

volts ampere

any postmen.		
HEATER VOLTAGE (AC DC)	:	\$ 60 E =
HEATER CURRENT	Without	With
Z 2	External	External
DIRECT [NTERELECTRODE CAPACITANCES (Approx.):	Shield	Shield
	D. 52	20.0
Grid to Cathode, Heater, and Internal Shield.	000	7 -
Plate to Cathode, Heater, and Internal Shield	8 17	7
 With external shield connected to eathode. 		

n a d

	volts	watts	volts volts
	150 mar 0 max	2.2 max	100 max 100 max
CLASS A, AMPLIFIER Maximum Perfinas, (Destin-Maximum Values):	PLATE VOLTAGE. CEIN VOLTAGE. Destitive-bias value	CATHODE CURRENT. PLATE DISSIPATION.	PEAK HENTER-CATHODE VULANUE Heater negative with respect to eathode. Heater positive with respect to cathode.



THREE-PLATE TETRODE MEDIUM-MU TRIODE-

ohms umhos

ma

Vo)tB volts Miniature type used in complex-

wave generator applications. Sharp-cutoff tetrodeunit has pair of additional TION. Tube requires nine-contact socket and may be mounted in any plates. Outline 8B, OUTLINES SEC-Ø,MTR F

position.

volta ampere SEEE EEE 0.06 max 4.5 1.4 0.35 max 0.008 max 630 Heater Voltage (ac/dc)
Heater Curent
Direct Inverelectrode Capacitances:
Triode Unit: Grid to Plate.
Grid to Cathode and Heater.
Plate to Cathode and Heater.
Tetrode Unit: Terong Min to Plate No.2.

Grid No.1 to Cathode, Heater, Grid No.2, Plate No.1A, and Plate No.1B

Flate No.2 to Cathode, Heater, Grid No.2, Plate No.1A, and Plate No.1B

Tetrode Grid No.1 to Triode Plate.

Tetrode Plate No.2 to Triode Plate. "With external shield connected to cathode.

CLASS A, AMPLIFIER

	volts	VOIE	ohme	soquin	volts	:	volts	A OICS	271
	100	7:	7400	5400	e. - 7	e at Socket	250	nez.	
						Tetrode Unit with Plates No. 1A and No. 1B Connected to Cathode at Socket	: : : : : : : : : : : : : : : : : : : :		
jn it						Vo. 1B Conne			
Triode Unit		• • • • • • • • • • • • •			nt of 100 µa.	No. 1A and ?			
			:		r plate currel	t with Plates			
ä			Factor	nce (Approx.	(Anorox.) fo	Tetrode Uni	oltage	oltage	
Characteristics	Plate Voltage	Grid Voltage.	Amplification Factor	riate ivesistance (Approx.).	Plate Current. Grid Voltage (Anprox.) for plate current of 100 µa.		Plate-No.2 Voltage.	Grid-No.2 Voltage	

Characteristics:

volts
volt
ohms
µmhos
ma

135 -1 5600 9000 111 -5,5

megohm

1 max

AVERAGE PLATE CHARACTERISTICS

TYPE 6FHS

	- 1
'n	
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	- 7

	7 ·
Original Valuese	0.75 meg
Franconductance, Grid No.1 to Plate No.2	4400
Plate-No.2 Current	٠.
Call No 2 Current	# L
Grid-No.1 Voltage (Approx.) for plate-No.2 current of 100 µa.	ī

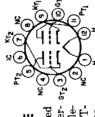
COMPLEX-WAVE GENERATOR

	275 max	275 max	volts
PLATE VOLTAGE		200 mar	volts
PLATE-NO.1A VOLTAGE		200 max	volts
Plate-No.1B Voltage		275 max	volts
PLATE-NO.2 VOLTAGE.	:	275 max	volts
GRID-NO.2 (SCREEN-GRID) SUIPLY VOLTAGE	i	See curve page 70	page 70
GRID-NO.2 VOLTAGE			
GRID-NO.1 (CONTROL-GRID) VOLTAGE:	4.0 000	-40 mar	volts
Negative-bias value	2020	0 2002	volts
Positive-bias value	1 7 2007		watts
PLATE DISSIPATION	7 - 1 Men	0. 3 max	watt
PLATE-NO.1A DISSIPATION.		0 3 max	watt
PLATE-NO.1B DISSIPATION.		9.3 max	watts
PLATE-NO.2 DISSIPATION			
GRID-No.2 INPUT:	ı	0.45 max	watt
For grid-No.2 voltages up to 137,5 volts.	1	See curve page 70	page 70

volts	volts	volt	ma	ECT.	ma	ma		soquit	mpus	amhos	L
100	200	7	0.04	10 C	9	0		7.0	20	9500	1
Typical Operation With Separate Plate Operation (Letrois Chie).	Plates-No.1A, No.1B, and No.2 Voltage	Grid-No.2 Voltage	Grid-No.1 Voltage	Plate-No.1A Current	Plate-No.1B Current.	Plate-No.2 Current	Grid-No.2 Current	Transconductance (Approx.):	Grid No.1 to Plate No.1A	Grid No.1 to Plate No.1B	Grid No.1 to Plate No.2.

Grid-No.1-Circuit Resistance: For fixed-bias operation.... Maximum Circuit Values:

Triode Unit Tetrode Unit 0.5 max 0.5 max megohm vertical-deflection-oscillator and ver- or23 Duodecar type used as combined tical-deflection-amplifier tube in tele-MEDIUM-MU DUAL TRIODE



decar twelve-contact socket and may be mounted in any position. Heater volts vision receivers. Outline 12B, OUT-LINES SECTION. Tube requires duo-

CLASS A, AMPLIFIER

(ac/dc), 6.3; amperes, 0.9.

volts volts	ohms	mp ma	Ā	
Unit No.1 Unit No.2 250 150 250 -8 0 -9.5	.40	l ox	120	
Characteristics: Plate Voltage:	Amplification Pactor	Plate Resistance (Approx.). Transconductance	Plate Current. Grid Voltage (Approx.) for plate current of 10 µa	Grid Voltage (Approx.) for plate current of 50 μ a

VERTICAL-DEFLECTION OSCILLATOR AND AMPLIFIER For operation in a 525-line, 20-frame system

	2500 max volts -250 max volts	150 max ma 50 max ma 10 max watts	
_	200 max - 400 max	- 1 max	200 max 200 max
Maximom Ratings, (Design-Maximum Values):	DC PLATE VOLTAGE PRAR POSITIVE-PULSE PLATE VOLTAGE* DEAN NEGATIVE-PULSE GRIP VOLTAGE*	PEAK CATHODE CURRENT AVERAGE CATHODE CURRENT	PLATE LUSSIFATION PDAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode Heater positive with respect to

= Technical Data

Maximum Circuit Values:

volts nhos ma ma volts

o o o more more of o		megohms - z	This value can be measured by a method involving a recurrent waveform such that the maximum
0 0	702	2.2 max	vaveform
	: : :	:	recurrent 1
			involving a
			a method
	For fixed-bias operation	ias operation	vd beautied by
CINT CITCUIT THE PROPERTY.	For fixed-bias	For cathode-bias operation.	This value can b

• The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.
• The dc component must not exceed 100 volts. Inis value can be measured by a necuratings of the tube will not be exceeded.

<u>ه</u>

DUAL TRIODE

Duodecar type used as combined vertical-deflection oscillator and vertical-deflection amplifier in television receivers. The high-mu triode unit No.1 is used as an oscillator, and the low-

mu triode unit No.2 is used as an amplifier. Outline 12B, OUTLINES SECTION. Tube requires duodecar twelve-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 1.05.

CLASS A: AMPLIFIER

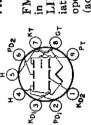
Characteristics	Unit No. 1 Unit No. 2	Init No. 2		
	250	175	voits	
Flate voluge	2	. (
Crid Voltage	1	62-	VOITE	
Amalifortion Postor	99	5.55		
Amphilestian Factor	00000	060	openio	
Plate Resistance (Approx.)	20000	240	STREET,	
Transconductance	2200	0009	soquan	
Grid Voltage (Approx.) for plate current of 20 as		ı	volts	
Call Wother (Approx.) for plate current of 200 as	1	45	volts	
dill voltage (Applicat) for piece carriers of the present	,		i	
Plate Current,	7	40	IDB	
VERTICAL-DEFLECTION OSCILLATOR AND AMPLIFIER	UD AMPLIFIER			
For operation in a 525-line, 30-frame system	e system			
Maximum Ratinas. (Design-Maximum Values):	Oscillator	Amplifier		
DC PLANE Volume CE	350 max	550 max	volts	

	:	volts	volts	volts	ma	ma	watts	•	volts	volts
	Amplifier	550 max	1500 max	-250 max	175 max	50 max	10 max	;	200 max	200 max
System.	Oscillator	350 max	I	-400 max	ı	1	1 max		200 max	200=max
For operation in a 223-line, 20-frame system	Maximum Ratings, (Design-Maximum Values):	DC PLATE VOLTAGE	Peak Positive-Pulse Plate Voltage#	PEAK NEGATIVE-PULSE PLATE VOLTAGE	PEAK CATHODE CURRENT	AVERAGE CATHODE CURRENT	PLATE DISSIPATION†	Peak Heater-Cathode Voltage:	Heater negative with respect to cathode	Heater positive with respect to cathode

Maximum Circuit Values: Grid-Circuit Resistance:

Grid-Circuit Resistance:		•
For fixed-bigs operation	1 max 1	1 max megohm
For cathode-bias operation	2.2 max 2.2	2.2 max megohms
# The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a	one vertical scan	ning cycle. In a
525-line, 30-frame system, 15 per cent of one vertical scanning cycle	is 2.5 millisecond	ď.
+ An adequate bias resistor or other means is required to protect the tube in the absence of excitation.	tube in the absen	ce of excitation.
The dc component must not exceed 100 volts.		

TWIN DIODE-HIGH-MU TRIODE



FM detector and af voltage amplifier in FM receivers. Outline 8B, OUTiature nine-contact socket and may be operated in any position. Heater volts Miniature type used as combined LINES SECTION. Tube requires min-(ac/dc), 6.3; amperes, 0.45.

TRIODE UNIT AS CLASS A, AMPLIFIER

Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE	GRID VOLTAGE, Positive-bias value
Maximum Ratin	PLATE VOLTAGE	GRID VOLTAGE,

volts volts 273

330 max 0 max

PLATE DISSIPATION	1.1 max	watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode.	200 max 200° max	volts volts
Characteristics:	4	11.
Plate Voltage	99°	SILOY STICH
Crid Voltage	9 6	6010A
Amplification Factor	00000	a Line
Plate Resistance (Approx.)	1200	empos
Transconductance	-	Ē
Plate Current.	•	

DIODE UNITS (Each Unit)

Ē		volts	
5 max		200 max	
Maximum Ratings, (Design-Muximum Values):	PLATE CURRENT	Peak Heater-Cathobe Vollage: Heater negative with respect to cathode	Heater positive with respect to cathode

Characteristics, Instantaneous Value:

volts

ĸ

Tube Voltage Drop for plate current of 20 ma. o The dc component must not exceed 100 volts

HIGH-MU TRIODE

of television receivers. Outline 7B, Miniature type with frame grid used as rf-amplifier tube in whf tuners OUTLINES SECTION. Tube requires miniature seven-contact socket

and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.18.

CLASS A, AMPLIFIER

volts volts ma watts volts	volts volts ohms µmhos ma volts
200 max -50 max 22 max 2.5 max 100 max	135 -1.2 74 6300 12000 8 9
Maximum Ratings, (Design-Maximum Values): PLATE VOLTAGE. AND VOLTAGE. Negative-bias value. AND VOLTAGE. Negative-bias value. PLATE DISSILATION PLATE DISSILATION PLATE Haater negative with respect to cathode. Heater negative with respect to cathode.	Characteristics: Plate Voltage Grid Voltage Amplification Factor. Plate Resistance (Approx.) Plate Current. Plate Current. Grid Voltage (Approx.) for plate current of 100 µa.

MEDIUM-MU TWIN TRIODE

Grid-Circuit Resistance: For cathode-bias operation.....

Maximum Circuit Values:

AT2(3)

1 max megohm

cillator in television receivers. Outline cr2 Miniature type used as combined 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket vertical- and horizontal-deflection os-

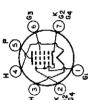
> Related type: 8FQ7

volts ampere seconds this type is identical with miniature type 6CG7. For typical operation as a resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER SECTION. and may be operated in any position. Except for direct interelectrode capacitances,

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HEATER VOLTAGE (AC/DC)	HEATER CURRENT.	HEATER WARM-UP TIME (AVERAGE)
~	₹	₹
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耳	Д	П

= Technical Data

<u> </u>
Unit No. 2 8.8 2.4 0.26
Unit.No.1 3.6 2.4 0.34
DIRECT INTERELECTRODE CAPACITANCES (Approx.): Grid to Plate. Grid to Cathode and Heater. Plate to Cathode and Heater. Plate to Unit No.1 to Plate of Unit No.2.



BEAM HEXODE

fier tube in vhf television receivers. In grid No.2 is a focusing grid, grid No.3 is the screen grid, and grid No.4 is the Miniature type used as rf-amplithis tube, grid No.1 is the control grid,

Related type:

and aligned with grid No.3. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position. Heater suppressor grid. Grid No.2 is internally connected to the cathode and grid No.4, volts (ac/dc), 6.3; amperes, 0.2.

CLASS A. AMPLIFIED

	300 max volts	-50 max v	20 max ma 0.15 max watt 3.25 max watts	200 max volts	275 volts 185 volts 0.2 volt 0.24 megohm 10000 mhos 9 ma 0.17 ma -5 volts
CLASS AT AMPLITIES (Decision-Mandoman Values).	MAXIMOM AGINGS, (Losgie-mazimom funco). Prate Voltagene (Losgie-mazimom Voltage). Grid-No.3 (screen-grid) Voltage	Grip-No i Control-Grip) Voltage: Negative-bias value Positive-bias value	CATERDE CURRENT GRID-NO 3 INPUT. PLATE DISSIPATION VANDAGE	FEAR Clear Refer to the voltage of the Feat Feat Feat Feat Feat Feat Feat Fea	Characteristics: Plate Voltage Grid-No.3 Voltage Grid-No.3 Voltage Grid-No.1 Voltage Grid-No.2 Voltage Grid-No.3 Current. Grid-No.3 Current. Anximum Circuit Yolues: Grid-No.1-Circuit Resistance, for fixed-bias operation The de component must not exceed 100 volts.

SHARP-CUTOFF TETRODE

Miniature type used as rf amplifier in whf tuners of television receivers. Tube requires seven-contact socket Outline 7B, OUTLINES SECTION. and may be mounted in any position.



volts ampere	####
ස දුර ල ර	0.03 max 4.5 3.7•
ATER VOLTAGE (AC/DC)mpp Curbent	THE STATEMENT OF THE ST

HEATER VOLTAGE (AC/DC)... HEATER CURRENT...... DIRECT INTERELECTRODE CA

With external shield connected to cathode except as noted.

With external shield connected to ground.

	ere wolts	180 max volts	0 mpx volts	
CLASS A: AMPLINER	Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE. CRIP-No.2 (SOREEN-GRID) SUPPLY VOLTAGE.	GRID-NO.2 VOLTAGE. GRID-NO.1 (CONTROL-GRID) VOLTAGE, POSITIVE-bias value.	

ma	watt page 70 watts	volts volts	volts volts volt megohm µmhos ma
20 тах	0.5 max watt See curve page 70 2 max watts	200 max 200*max	125 80 80 0.1 8000 1.5 -6
Cathods Current,	GRID-No.2 INPUT: For grid-No.2 voltages up to 90 volts For grid-No.2 voltages between 90 and 180 volts D. one Discipation	PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode.	Characteristics: Plate Voltage Grid-No.2 Voltage Grid-No.2 Voltage Grid-No.2 Voltage Flate Resistance (Approx.) Transconductance Transconductance Grid-No.2 Current. Grid-No.2 Current. Grid-No.1 Voltage (Approx.) for plate current of 20 µa

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-

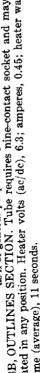
* The dc component must not exceed 100 volts. Grid-No.1-Circuit Resistance.....

Maximum Circuit Value:

6FV8A Related type: **6FV8**

5FV8

deflection oscillator; pentode is used as if or general-purpose amplifier. Out-Miniature type used in television amplifier. Triode is used as vertical receivers as combined oscillator and

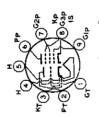


CLASS A, AMPLIFIER

330 max volts 330 max volts See curve page 70 0 max volts 2.3 max watts	0.55 max watt	200 max volts	0.25 max megohm
	See curve page 70	200°max volts	1 max megohm
Maximum Ratings, (Design-Maximum Values): PATE VOLTAGES GRID-NO.2 (SCREEN-CRID) SUPPLY VOLTAGE GRID-NO.2 VOLTAGE GRID-NO.2 VOLTAGE GRID-NO.2 VOLTAGE PLATE DISSIPATION PLATE DISSIPATION	GRID-No.2 InPUT: For grid-No.2 voltages up to 165 volts. For grid-No.2 voltages between 165 and 830 volts.	Prak Heater Cathode Voltage: Heater negative with respect to cathode. Heater positive with respect to cathode.	Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation.

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330 max 250 max 70 max 20 max



line 8B, OUTLINES SECTION. Tube requires nine-contact socket and may be operated in any position. Heater volts (ac/dc), 6.3; amperes, 0.45; heater warmup time (average), 11 seconds.

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Values	
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Ratings,	
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3.36 maz. volts	ve na	0 max volts		ve pa		200°max volts
	PLATE VOLTAGEGRID) SUPPLY VOLTAGE	GRID-NO.2 VOLTAGE. GRID-NO.1 (CONTROL-GRID) VOLTAGE, POSITIVE-bias value.	PLATE DISSIPATION	For grid-No.2 voltages up to 165 volts.	PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode.

			For eathode-bias operation	
ximum Circuit Values:	d-No.1-Circuit Resistance:	bias operation	de-bias operation	
ximum Cir	4-No.1-Cir	For fixed	For eatho	

	Triode Unit	Pentode
Characteristics:	6FV8 6FV8A	Unit
Plate Voltage	621 621	125
Grid-No.2 Voltage	7	1
Grid-No.1 Voltage	40 45	ı
Amplification Factor	5000 5500	200000
Plate Resistance (Approx.)		6500
Transconductance		6-
Grid-No.1 Voltage (Approx.) for place current of the	77	12
Plate Current.	. !	4
Grid-No.2 Current		

ohms µmhcs volts

volt

Ę For operation in a 525-line, 39-frame system

= Technical Data =

Plate Dissipation,	z max	Watts
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	200 max 200°max	volts volts
Maximum Circuit Values:		
Grid-Circuit Resistance: For cathode-bias operation	3 max 1	3 max megohms
 The dc component must not exceed 100 volts. 		

BEAM POWER TUBE

ceivers. Outline 19A, OUTLINES SECTION. Tube requires octal socket and may be mounted in any position. Glass octal type used as horizontal-Heater volts (ac/dc), 6.3; amperes, 1.2. deflection amplifier in television re-

megohm

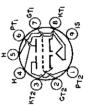
0,5 max

HORIZONTAL-DEFLECTION AMPLIFIER

For operation in a 525-line, 30-frame system

Maximum Potings (Design-Maximum Values):		
	770 max	volts
DC PLATE VOLTAGE	00.00	1
Dear Bourner-Pilium Plate Voltage	eson max	VOICE
FRAN LOSITATION CONTRACTOR	220 max	voits
DC GRID-NO.2 (SCREEN-GRID) VOLLAGE	120 mag	volte
PEAR NEGATIVE-PULSE GRID-NO.1 VOLTAGE	700	3
D. Chim. No. 1 (CONTROL -GRID) VOLTAGE.	-55 max	voits
	610 max	ma
PEAK CATHODE CURRENT	100	,
AVERAGE CATHODE CURRENT	2011 011	1114
GRID-No.2 INPUT.	3.0 780.5	Water
PLATE DISSIPATION.	20 Mar	WHILE
PEAK HEATER-CATHODE VOLTAGE:	000	1
Heater negative with respect to cathode	Z00 max	VOILS
Heater positive with respect to cathode	200-max	voite
BULB TEMPERATURE (At hottest point)	770 max	۲

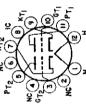
• An adequate bias resistor or other means is required to protect the tube in the absence of excitation.



MEDIUM-MU TWIN TRIODE

as the direct-coupled grounded-cathode driver for the other unit. Outline 8B, OUTLINES SECTION. Tube requires nine-contact socket. Heater volts (ac/dc), 6.3; amperes, 0.4. Charode-drive rf-amplifier circuits of vhf television tuners. In such circuits, one triode unit is used Miniature type used in direct-coupled cath-

plate volts, 100 (250 max); grid volts, -1.2; amplification factor, 33; plate resistance (approx.), 2500 ohms; transcorductance, 13000 µmhos; plate ma., 15; eathode ma., 22 max; plate dissipation, 2.2 max watts; peak heater-cathode volts, 200 max (the dc component must not exceed 100 volts). This type is used principally for renewal purposes.



DUAL TRIODE

Duodecar type used as combined ceivers. The high-mu triode unit No.1 is used as an oscillator, and the lowvertica!-deflection oscillator and vertical-deflection amplifier in television re-

Related type: **6FY7** 15FY7 mu triode unit No.2 is used as an amplifier. Outline 12D, OUTLINES SECTION.

Tube requires duodecar twelve-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 1.05.

CLASS A, AMPLIFIER

	Unit No. 1	Unit No. 1 Unit No. 2	
Characteristics:	950	150	volts
Plate Voltage.	007	- L	volts
Grid Voltage.	0 H	9.5	
Amplification Factor	00901	000	smdo
Plate Resistance (Approx.)	00004	1500	hos
Transconductance	0001	000	volts
Grid Voltage (Approx.) for plate current of 30 µa	-0.6	X.	volts
Grid Voltage (Approx.) for plate current of 50 µa	i ¬	45	E H
Plate Current.		2 =	ma
Plate Current (Approx.) for grid voltage of -29 volts	I	2	

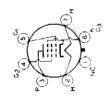
		volts	volts	ma	watts	volts	
	Unit No. 2	Amplifier 975 mar	2000 max	-250 max 175 max	50 max 7†max	200 max	2
D AMPLIFIER	system Unit No. 1	Oscillator	T991 1000	-400 max 70 max	20 max 1 max	200 max	400 max
VERTICAL-DEFLECTION OSCILLATOR AND AMPLIFIER	For operation in a 525-line, 30-frame system U ni	Maximum Ratings, (Design-Maximum Values):	DC PLATE VOLTAGE. DEAR POSITIVE-PHISE PLATE VOLTAGE#	PEAK CATHOR CURRENT.	AVERAGE CATHODE CURRENT PLANE DISSIPATION	PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	Heater positive with respect to cathode

Values:
Circuit
Maximum

				9 9 max meanhms	
Grid-Circuit Resistance	z z maz	37	3 J	T. I.	
# The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a	one ve	rtical	scanning	cycle, in a	
595-line 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 millseconds.	1 2 2 1	nilise	onds.	The state of the s	
An adequate bias resistor or other means is required to protect the tube in the absence of excitation.	upe in	the a	osence or	eachta clour.	
The dc component must not exceed 100 volts.					

POWER PENTODE

Tube requires octal socket. Except for inter-175000 ohms, this type is electrically identical with type 6AK6. Heater volts (ac/dc), 6.3, amperes, 0.15. Type 6G6-G is used principally radio receivers where moderate power output is required. Outline 22, OUTLINES SECTION. electrode capacitances and a plate resistance of Glass octal type used in output stage of or renewal purposes.



SHARP-CUTOFF PENTODE BEAM POWER TUBE-

plifier in television receivers. Outline 12B, OUTLINES SECTION. Tubere-Duodecar type used as FM detector and audio-frequency output am-

(IO)62B

63P(4)

<u>~</u>)≖

and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 1.2. quires duodecar twelve-contact socket

BEAM POWER TUBE UNIT AS CLASS A, AMPLIFIER

	195 mark Volts			1.8 max watts		zog-max volts
Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE	GRID-NO.2 (SCREEN-GRID) VOLTAGE	AVERAGE CATHODE CURRENT PLATE DISSIPATION.	GRID-NO.2 INPUT	Prak Heater negative with respect to cathode	Heater positive with respect to cathode

Maximum-Signal Plate Current Plate Resistance (Approx.) Maximum-Signal Grid-No.2 Current. Fransconductance Zero-Signal Grid-No.2 Jurrent. PENTODE UNIT AS CLASS A. AMPLIFIER Maximum-Signal Power Output..... Peak AF Grid-No.1 Voltage.... Grid-No.1 (Control-Grid) Voltage. Zero-Signal Plate Current.... Load Resistance....Total Harmonic Distortion. voical Operation: Grid-No.2 Voltage. Characteristics: Plate Supply Vo Plate Voltage. Grid Grid Flat Grid Grid Grid

ma ma ma ma

8 49 50

volts volts volts

= Technical Data ===

4mbos ohms

8.5 10000 7500 2500

per cent

100 560 0.15 mag 1000 pl 1.3 l -4.5	the Supply Voltage	150	υA
100 560 0.15 meg 1000 pri 1.3 pri 1.3 -4.5	L.No. 3 (Suppressor-Grid) Voltage.	0	ΔA
560 0.15 me 1000 p 400 p 1.3 1.3 -4.5	A.No.2 (Screen-Grid) Supply Voltage	100	2
1000 1000 400 1.3 4.5 4.5	hode-Bias Resistor.	260	Чo
1000 400 1.3 -4.5 4.5	Pesistance (Approx.)	0.15	mego
400 1.3 -4.5 -4.5	naconductance, Grid No.1 to Plate	1000	[III]
1,3 2,5 4,5	naconductance, Grid No.3 to Plate	400	E T
4- 4-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6	ce Current.	٦. د	
4.4. 6.5.	d-No.2 Current.	64	
- 4.5	4-No.1 Voltage (Approx.) for plate current of 10 µa.	-4·5	ž
	4-No.3 Voitage (Approx.) for plate current of 10 µa.	- 4.5	Ā

olts olts olts olts olts olts olts ma

PENTODE UNIT AS FM DETECTOR

volts volts

> maxmax

330 88

See curve page 70 0 max volts

watts watts

max max

0.7

volts voits

200 max 200 max

See curve page 70

Maximum Ratings, (Design-Maximum Values):
CARID-NO.3 VOLTAGE.
Grid-No.2 Supply Voltage
GRID-NO.2 VOLTAGE.
GRID-No.1 (CONTROL-GRID) VOLTAGE, Positive-bias value
PLATE DISSIPATION
GRID-No.2 INPUT:
For grid-No.2 voltages up to 165 volts.
For grid-No.2 voltages between 165 and 330 volts

Heater positive with respect to cathode..... The dc component must not exceed 100 volts.

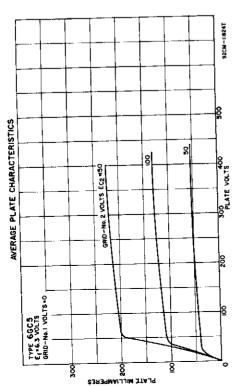
Heater negative with respect to cathode....

PEAK HEATER-CATHODE VOLTAGE:

BEAM POWER TUBE

Neonoval type used as output tube in audio-amplifier applications. Outline 11C, OUTLINES SECTION. Tube requires neonoval nine-contact socket and may be mounted in any position.

Grid No.1 to Plate Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3 Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3 CLASS A₁ AMPLIFIER Maximum Ratings, (Design-Maximum Values): PLATE VOLTAGE GRID-NO.2 (SURBER-GRID) VOLTAGE GRID-NO.2 (SURBER-GRID) VOLTAGE PLATE DISSIPATION Heater negative with respect to cathode Heater positive with respect to cathode 200 max volts Heater negative with respect to cathode 200 max volts Heater negative with respect to cathode 200 max volts
220 max 140 max 1.4 max 12 max 200 max 200 max
220 max 140 max 1.4 max 12 max 200 max 200 max
o esthode. 200 war cathode. 200#max



volts	volts	ohms	em.		ma ma			per cent watts	
200	125	180	8.9 46	47	61 00 63 TC	28000	8000 4000	10 3.8	
110	110		7.5		4.0	_	8000 2000		
Typical Operation and Characteristics:	Plate VoltageGrid-No.2 Voltage	Grid-No.1 Voltage	Cathode-Dias register Peak AF Grid-No.1 Voltage	Zero-Signal Plate Current	Maximum-Signal Plate Current.	Maximum-Signal Grid-No.2 Current	Plate Resistance (APPLOA)	Load Resistance Total Harmonic Distortion Maximum-Signal Power Output.	

0	0.5		
Maximum Circuit Values: Grid-No.1-Circuit Resistance:	For fixed-bias operation	For cathode-bias operation	The de component must not exceed 100 volts.

megohm megohm

max max

92CM-11B27T CHID~NºS WILLIAMPERES (IC2) AVERAGE CHARACTERISTICS FRID-No.1 VOLTS ECI=0 TYPE 66C5 E,=6.3 VOLTS GRID-No,2 VOLTS *IIO ٤ 8 ĸ (AI) SBRBRMATULM BTAJR

= Technical Data ==

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BEAM POWER TUBE

receivers. Outline 20, OUTLINES SECTION. Tube requires duodecar Duodecar type used as horizontaldeflection-amplifier tube in television

Related types: 12GES, 17GES **6GE5**

mounted in any position. Heater volts (ac/dc), 6.3; amperes, 1.2. twelve-contact socket and may be

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Characteristics:		
Dista Valtage	60 250	volts
Cuta-No 9 (Seven-Grid) Voltage	150 150	volts
Grid-No.1 (Control-Grid) Voltage	0 -22.5	volts
Triode Amnlification Factor*	4.4	
Diete Resistance (Anninx.)	- 18000	ohms
Liane treatment of the first of the treatment of the trea	- 7300	#mhos
Diate Current	345* 65	TOR
Cald. No 9 Current	27. 1.8	BOT
Chid-No 1 Voltage (Approx.) for plate current of 1 ms.	- 42	voits

* Triode connection (grid No.2 tied to plate); plate and grid-No.2 volts = 150.

• This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

HORIZONTAL-DEFLECTION AMPLIFIER

776 max volts		-1500 max volts 220 max volts		ř				3.5 max watts	200 max volts	>	200 max °C
770	6200	7	,			,					-
Maximum Ratings, (Design-Maximum Values): DC De are Street & Vottage	PEAR POSITIVE-PULSE PLATE VOLTAGE#,	PEAK NEGATIVE-PULSE PLATE VOLTAGE.	DC GRID-NO.2 VOLTAGE	DC GRID-No.1 VOLTAGE	PEAK CATHODE CURRENT	AVERAGE CATHODE CURRENT	PLATE DISSIPATION	GRID-NO.2 INPUT.	PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode	Bulb Temperature (At hotiest point)

#The duration of the voltage pulse must not exceed 16 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

† An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

| The dc component must not exceed 100 volts. 1 max megohm Grid-No.1-Circuit Resistance...... Maximum Circuit Values:



BEAM POWER TUBE

ceivers. Outline 12D, OUTLINES SECTION. Tube requires duodecar twelve-contact socket and may be Duodecar type used as horizontaldeflection amplifier in television re-

mounted in any position. Heater volts (ac/dc), 6.3; amperes, 1.2.

	volts	volts	volts	1	megonu	SOM THE		10 to 1	87104	281
	250	150	-26.5	4.5	97.7	4700	*° -	0.1	440	
	9	150	0	ı	1	1 1	345	.00	i	
Characteristics: Characteristics:	Plate Voltere	Grid-No.2 (Streen-Grid) Voltage	Grid-No.1 (Control-Grid) Voltage	Triode Amplification Factor*	Plate Resistance (Approx.)	Transconductance,	Plate Current	Grid-No.2 Current,	Grid-No.1 Voltage (Approx.) for plate current of 1 ma	

For operation in a 525-line, 30-frame system Maximum Ratings, (Design-Maximum Values):

OC PLATE SUPPLY VOLTAGE	770 max	volts
PEAK POSITIVE-PULSE PLATE VOLTAGE#	5000 max	volts
PEAK NEGATIVE-PULSE PLATE VOLTAGE.	-1500 max	volts
DC GRID-No.2 Voltage,	220 max	volts
PEAK NEGATIVE-PULSE GRID-No.1 VOLTAGE	-330 max	volts
VEGATIVE DC GRID-No.1 VOLTAGE.	-55 max	volts
PRAK CATHODE CURRENT	500 max	ma
AVERAGE CATHODE CURRENT.	160 max	ma
PLATE DISSIPATION†	9 max	watta
GRID-No.2 INPUT.	2.5 max	watts
PBAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max	volts
Heater positive with respect to eathode	200 max	volts
BULB TEMPERATURE (At hottest point)	200 max	ပ္

1 max megobm Grid-No.1-Circuit Resistance...... Maximum Circuit Values:

• These values can be measured by a method involving a recurrent waveform such that the maximum * Triode connection (grid No.2 connected to plate); plate and grid-No.2 volts =150.

ratings of the tube will not be exceeded.

#The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

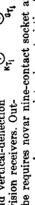
An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

The de component must not exceed 100 volts.

DUAL TRIODE







line 10A, OUTLINES SECTION. Tube requires novar nine-contact socket and may be mounted in any position. For curves of average plate characteristics for Unit No.1 and Unit No.2, refer to types 6DR7 (Unit No.1) and 6EM7, respectively.

Heater Voltage (ac/dc)		e. 9	volts
Heater Current		0.985	ampere
DIRECT INTERELECTRODE CAPACITANCES (Approx.)	Unit No.1	Unit No.2	
Grid to Plate	4.6	o,	jď
Grid to Cathode and Heater,	4.2	6.5	ď
Plate to Cathode and Heater	0.26	1.4	ъ
CLASS A, AMPLIFIER			
	Unit No.1	Unit No.2	
Plate Voltage	250	150	volts
Grid Voltage	ရာ	-20	volts
Amplification Factor	64	5.4	
Plate Resistance (Approx.)	40000	750	ohms
Transconductance	1600	7200	gound

volts volts ma H H

-5.5

- 45 50 50 50 10

VERTICAL-DEFLECTION OSCILLATOR AND AMPLIFIER

For plate voltage of 60 volts and zero grid voltage..... For plate current of 100 µa.....

Plate Current...

For plate current of 10 µa.....

Grid Voltage (Approx.):

For grid voltage of -28 volts....

For operation in a 525-line, 30-frame system	aystem		
	Unit No.1	Unit No.2	
Maximum Ratings, (Design-Maximum Values):	Oscillator	Amplifier	
DC PLATE VOLTAGE	330 max	330 max	
PEAK POSITIVE-PULSE PLATE VOLTAGE (Absolute Maximum)#	1	1500°max	-
PEAK NEGATIVE-PULSE GRID VOLTAGE	-400 max	-250 max	
PEAK CATHODE CURRENT	77 max	175 max	
AVERAGE CATHODE CURRENT.	22 max	50 max	

volts volts

rojts

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= Technical Data=

PLATE DISSIPATION	1.5 max	11 max	watts
Heater negative with respect to cathode.	200 max	200 max	voits
Heater positive with respect to cathode	200 -max	200 max	volts
Maximum Circuit Values:			
Grid-Circuit Resistance:			
For grid-resistor-bias or cathode-bias operation	2.2 max	2.2 max megohms	egohms
# Under no circumstances should this absolute value be exceeded.			
• The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a	f one vertical	l scanning cy	ile. In a

525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds. The dc component must not exceed 100 volts.

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE

cuits in television receivers. Also used Miniature types used in multivifor age-amplifier or sync-separator apbrator-type horizontal-deflection cir-ئ ق

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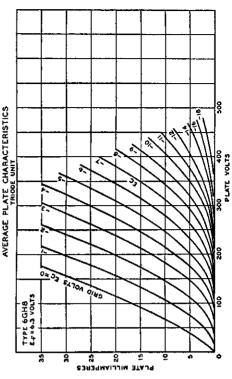
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6GH8A **6GH8** Related type: 5GHB

OUTLINES SECTION. Tubes require miniature nine-contact socket and may be mounted in any position. Type 6GH8-A is specially controlled to assure low interplications in such receivers, Outline 8B, electrode leakage.

volts ampere seconds	jd	þį	pf pf	pţ	þđ	pt pf
6.3 0.45 11	6GH8A 1.7	တ	1.4	0.02 max	ro	6.65 6.65
	6GH8 1.6	3.4	1.7	0.02 max	5.5	23 83 83
HEATER VOLTAGE (AC/DC). HEATER CUBRENT. HEATER WARM-UP TIME (Average.).	DIRECT INTERELECTRODE CAPACITANCES: Triede Unit: Grid to Plate.	Cathode, and Internal Shield	Lake to Cathode and Internal Shield. Cathode and Internal Shield. Heater to Cathode.	Fentoge Omt. Grafal No.1 to Plate	Old Iver. to Cantouch Itemes, Gita Acts, Villa Acts, and Internal Shield.	Internal Shield



283

92CM-1042ITI

voits amperes

0.26 15 6.5

HEAPTE CURRENT
DIRECT INTERELECTRODE CAPACITANCES (Approx.):
Grid No.1 to Plate
Grid No.1 to Calhole, Heater, Grid No.2, and Grid No.3
Plate to Cathole, Heater, Grid No.2, and Grid No.3

HEATER VOLTAGE (AC/DC).

= Technical Data

volts volts volts

Triode Connection Pentode Connection

CLASS A, AMPLIFIER

Characteristics

285

CLASS A1 AMPLITER				_
Characteristics:	Triode Unit	Triode Unit Pentode Unit		****
Plate Voltage	125	125	volts	-
Grid-No.2 Voltage.	1	125	volts	
Grid-No.1 Voltage	7	7	volts	
Amplification Factor.	46	,		_
Plate Resistance (Approx.)	5400	200000	ohme	_
Transconductance	8500	7500	soum,	
Plate Current.	13.5	12	ma	_
Grid-No.2 Current	1	4	ma	
Grid-No.1 Voltage (Approx.) for plate current of 10 µa	œ	9 0	volts	
				۰

HORIZONTAL-DEPLECTION OSCILLATOR

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525-iin
in a
operation 1
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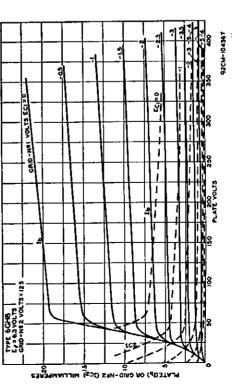
Maximum Ratings, (Design-Maximum Values):	Triode Unit	Triode Unit Pentode Unit	
PLATE VOLTAGE	330 max	350 max	voits
GRID-NO.2 (SCREEN-GRID) VOLTAGE	1	330 max	volts
GRID-No.1 (control-grid) Voltage:			•
Positive-bias value	0 max	0 max	volts
Peak negative value.	1	-175 max	volts
PEAK CATHODE CURRENT	ι	300 max	ma
AVERAGE CATHODE CURRENT.	ı	20 max	ma
GRID-No.2 INPUT.	1	0.55 max	watt
PLATE DISSIPATION	2.5 max	2,5 max	watts
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	200 max	200 max	volts
Heater positive with respect to cathode	200 -max	200 -max	volts
The dc component must not exceed 100 volts.			

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: For fixed-bias operation. For cathode-bias operation.

2.2 max megohms 2.2 max megohms 2.2 max 2.2 max

AVERAGE CHARACTERISTICS



BEAM POWER TUBE

6GJ5 Related types: 12GJS, 17GJS

of television receivers. Outline 18A, OUTLINES SECTION. Tube requires horizontal-deflection-amplifier circuits novar nine-contact socket and may be Novar type used in high-efficiency

operated in any position. For curve of average characteristics see type 6GW6.

ohms ma ma volts ma watts watts volts volts voits voits voits voits voits 200 max 200 max 240 max 770 max 6500 max 220 max -55 max -55 max -880 max 175 max 17.5 max 3.5 max 15000 7100 70 A DARA CATHOUR CURRENT
AVERAGE CATHOUR CURRENT
PLATE DISSIPATION®
GRID-No.2 Input DC Plate Supply Voltage.
Peak Negative-Pulse Plate Voltage*
Peak Negative-Pulse Plate Voltage.
DC Grid-No.2 Voltage
DC Grid-No.2 Voltage
Peak Negative-Pulse Grid-No.1 Voltage.
Peak Catiode Current VARIANCE ANTONIONE VOLTAGE:
PAR Harten-CATHODE VOLTAGE:
Heater negative with respect to cathode.
Heater positive with respect to cathode.
BULB TEMPERATURE (At hottest point) 390 For operation in a 525-line, 30-frame system HORIZONAL-DEFLECTION AMPLIFIER 150 150 -22.5 4.4 Plate Voltage Grid-No.2 Voltage Grid-No.1 Voltage Mu-Factor, grid No.2 to grid No.1. Plate Resistance (Approx.) Grid-No.2 Current Grid-No.1 Voltage for plate current of 1 ma Maximum Ratings, (Design-Maximum Values): Grid-No.1-Circuit Resistance: Maximum Circuit Values: | ransconductance . .

This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded. 1 maxFor grid-resistor-bias operation

*The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a \$25-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

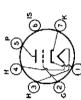
An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

The de component must not exceed 100 volts.

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-

quires miniature nine-contact socket and may be operated in any position. Heater volts (ac/dc) in series: 6.3; amperes, 0.3. Heater volts in zontal deflection circuits of television receivers. time (average), 11 seconds. Characteristics as Miniature type used as oscillator in horiparallel: 3.15; amperes, 0.6. Heater warm-up ₩ •

grid volts, -1; amplification factor, 40; plate resistance (approx.), 5000 ohms; transconductance, 8500 µmhos; plate ma., 13.5; pentode unit plate, grid-No.2 volts, 125; grid-No.1 volts, -1; plate resistance (approx.), 150,000 ohms; transconductance, 7500 µmhos; plate ma., 12; grid-No.2 ma., 4.5. Maximum grid volts, positive-bias value, 0 max; plate dissipation, 2.5 max watts; pentode unit: plate, grid-No.2 volts, 380 max; grid No.1, positive-bias value, 0 max volts, plate dissipation, 2.5 max watts. This is a DISCONTINUED TYPE listed for reference purposes only. ratings as horizontal-deflection oscillator (design-maximum values), triode unit: plate volts, 330 max; class A: Amplifier, triode unit: plate volts, 125;



HIGH-MU TRIODE

Miniature type with frame grid used as a grounded-cathode rf-amplifier tube in vhf tuners of television receivers. Outline 7B, OUTLINES SEC-TION. Tube requires miniature sevencontact socket and may be operated in any position.



volts ampere	
6.3 0.18	0 5. 89 5.00 5.00 8.00 8.00 8.00 8.00 8.00 8.00
Heater Voltage (ac/dc). Heater Current	DIRECT INTERELECTRODE CAPACITANCES (Approx.): Grid to Plate Grid to Cathode, Heater, and Internal Shield Plate to Cathode, Heater, and Internal Shield Heater to Cathode.

volts	volts volts ma watts	volts	volts volt ohms amhos ma volts volts ohms utf db
200 max	-50 max 0 max 22 max 2.5 max	100 max 100 max	135 -11 -27 -27 -27 -4.7
CLASS A, AMPLIFIER Maximum Ratings, (Design-Maximum Values): PLATE VOLTAGE.	Grid Voltages Negative-bias value Positive-bias value Average Cathode Current Plate Dissipation.	Heater negative with respect to cathode. Heater positive with respect to cathode.	Characteristics: Pate Voltage Grid Voltage Amplification Factor Amplification Factor Transconductance (Approx.) Transconductance of 150 µmhos Grid Voltage (Approx.) for transconductance of 150 µmhos Grid Voltage (Approx.) for transconductance of 1500 µmhos Input Capacitance Noise Figure

Maximum Circuit Values:

Grid-Circuit Resistance: For cathode-bias operation.....

With external shield connected to cathode, except as noted.

1 max megohm

• With external shield and internal shield connected to ground. • Measured at 200 Mc with heater volts = 6.8 and plate effectively grounded for rf voltages.

O For a neutralized triode amplifier at a frequency of 200 Mc with signal source impedance adjusted for minimum noise output.

AVERAGE PLATE CHARACTERISTICS

TYPE GGK5

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23939MAIJIM 372J9

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and also in the video output stage of television receivers. Outline 8E, OUT-LINES SECTION. Tube requires stage of audio amplifying equipment Miniature type used in the output

miniature nine-contact socket and may be operated in any position.

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= Technical Data

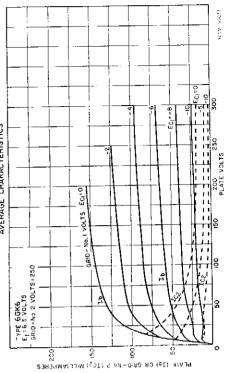
HEATER VOLTAGE (AC/DC). HEATER CURRENT	6.3 0.76	volts ampere
DIRECT INTERELECTRODE CAPACITANCES: Grid No.1 to Plate Agenta Rester, Grid No.2, Grid No.3, and Internal Shield Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	0.14 max 10	ដូចជួ
CLASS A ₁ AMPLIHER		
Maximum Rafings: (Design-Maximum Values):		;
PLATE SUPPLY VOLTAGE,	600 max	volts
FLATE VOLTAGE Cam-No 2 Supply Voltage	605 max	volts
GRID-NO.2 (SCREEN-GRID) VOLTAGE	330 max	volts
GRID-No.1 (CONTROL-GRID) VOLTACE, Negative-bias value	-100 max	volts
CATHODE CURRENT.	55 max	ma
FLATE DISSIPATION.	10.4 //tm	watts
Carle No 9 Instru Arcesoco	2 max	watts
PEAK HEATER-CATHODE VOLTAGE: HEATER EGATIVE With respect to cathode. Heater positive with respect to cathode.	100 max 100 max	volts
Characteristics and Typical Operation:		
Plate Supply Voltage	250	volts
Grid-No.2 Supply Voltage.	250	volts
Cathode-Bias Resistor.	135	ohms
Mu-Factor, Grid No.2 to Grid No.1	38000	ohms
Transconductance	11300	soquin
Peak AF Grid-No.1 Voltage.		volts
Zero-Signal Plate Current	50.6	ma
Zero-Signal Grid-No.2 Current.	ت	ma
Maximum-Signal Grid-No.2 Current.	10 5200	obms
Total Harmonic Distortion	2.	per cent
Maximum-Signal Power Output	 o	S S S S S S S S S S S S S S S S S S S

PUSH-PULL CLASS AB, and B AMPLIFIER

Maximum Ratings: (Same as for class A, amplifier)

dans to the same of the same o					
Ivnical Operation. (Values are for two tubes):	Class AB	AB_1	Class B	8 B	
	950	300	950	300	volts
Plate Voltage	007	200	3 0	006	volte
Grid-No.2 Voltage	250	300	nez.	000	0.10
Grid-No.1 Voltage	ı	ı	- 11.6	-14.7	SIIO.
Cathode Bise Position	130	130	ł	1	onms
Dealt A Carl Mo 1 to Carle No 1 Voltage	7 66	28	22.4	87	volts
Fear Ar Grid-No.1-64-Citie-140:1 Totals.	62	72	20	12	ma
24 St 1 Diete Ourreile	i K	6	75	95	ma
Maximum-Signal Flate Current		æ	6	9	ma
Zero-Signal Grid-ivo.2 Current	. ¥	66	I C	22	ma
Maximum-Signal Grid-No.2 Current	0000	1008	8000	RUHU	ohms
Effective Load Resistance (plate to plate)	0000	4	000	-7	per cent
Total Harmonic Distortion	;	-	;=	17	watts
Maximum-Signal Fower Output	11	•	;	;	

AVERAGE CHARACTERISTICS



Grid-No.1-Circuit Resistance: For fixed-bias operation..... For cathode-bias operation.....

megohm megohm 0.3 max 1 max KT2 Tube requires octal

DUAL TRIODE

Glass type containing high-mu triode and high-perveance, low-mu triode in same envelope. Used as combined vertical-deflection-oscillator and vertical-deflection-amplifier tube in

socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 1.05. Outline 14B, OUTLINES SECTION. television receivers.

CLASS AL AMPLIFIER

	volts	RIIOA	ohma	volta	volta
Unit No.1 Unit No.2	175	1 3 3 10 5	780 6400	'	8 9 4
Unit No.1	250	19	30000 2200	. 55.	64
Characteristics:	Plate Voltage.	Amplification Factor.	Plate Resistance (Approx.) Transconductance	Grid Voltage (Approx.): For plate current of 20 us.	For plate current of 200 μa .

VERTICAL-DEFLECTION OSCILLATOR AND AMPLIFIER

For operation in a 525-line, 30-frame system	Bystem		
•	Unit No.1	Unit No.2	
Maximum Ratings, (Design-Maximum Values):	Oscillator	Amplifier	
DC PLATE VOLTAGE,	350 max	550 max	ΔA
PEAK POSITIVE-PULSE PLATE VOLTAGE.	ţ	$1500^{\circ}max$	AO
Peak Negative-Pulse Grid Voltage	-400 max	-250 max	AO
Peak Cathode Current	- max	175 max	H
AVERAGE CATHODE CURRENT.	- 1102	50 max	Н
PLATE DISSIPATION®	1 max	10 max	Wat
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	200 max	200 max	DΛ
Heater positive with respect to cathode	200 $^{\bullet}max$	200 max	Ā

olts olts tts

Maximum Circuit Values:

1 max 2.2 max Grid-Circuit Resistance: For fixed-bins operation For cathode-bins operation

1 max megohm 2.2 max megohms

Darke duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

The dc component must not exceed 100 volts.

SEMIREMOTE-CUTOFF PENTODE

trolled picture-if stages of television Miniature type used in gain-conreceivers operating at intermediate fre-

and relatively low capacitances. Outline 7B. OUTLINES SECTION Tube features high transconductance quencies in the order of 40 megacycles.

 UTLINES SECTION. Tube re-	d in any position.	
and relatively low capacitances. Outline 7B, OUTLINES SECTION. Tube re-	quires seven-contact socket and may be mounted in any position.	

HEATER VOLTAGE (AC/DC). HEATER CURRENT.	7.7.4	6.3	volts ampere
DIRECT INTERELECTRODE CAPACITANCES;	w unoui External Shield	m un External Shield	
Grid No.1 to Plate. Grid No.1 to Cathode, Heater, Grid No.2. Grid No.3.	0.036 max	0.036 max 0.026 max	pf
and Internal Shield. Plate to Cathode, Heater, Grid No.2, Grid No.3, and	10	10	þď
Internal Shield	4.5	3.4	ρţ

288

= Technical Data

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Maximum Values):		
Plate Voltage	330 max	voits
GRID-NO.3 (SUPPRESSOR-GRID) VOLTAGE, Positive value	0 max	volte
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE.	330 max	volta
GRID-NO.2 VOLTAGE.	See curve page 70	1ge 70
GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	0 max	volts
PLATE DISSIPATION.	3.1 max	watts
GRID-NO.2 INPUT:		
For grid-No.2 voltages up to 165 volts.	0,65 max	watt
For grid-No.2 voltages between 165 and 330 volts.	See curve page 70	age 70
PEAK HEATER-CATHODE VOLTAGE:	•	,
Heater negative with respect to cathode	200 max	volts
Heater positive with respect to cathode.	200 max	volts
Characteristics		
Plate Supply Voltage	125	volta
Ond No.3	od to cathode at	socket
Grid-No 2 Surnly Voltage	125	volta
Cathodo Biss Resistor	145	am do
Cautate Instance Plate Perintance (America)		mhosem
Transconductores	13000	TO DO
Grid-No. J Voltage (Approx.) for transconductance of 60 umbos		volts
Plate Current	14	ma
Grid-No.2 Current.	3.4	mæ
• With external shield connected to cathode.		
 The dc component must not exceed 100 voits. 		

AVERAGE CHARACTERISTICS

										00*
			4,0		GRID-Nº1 VOLTS ECIF-I	81-	£C, 20	EC 2-2.5	 2	300 +
TYPE 6GM6 E. = 6.3 VOLTS GRID NEU AND INTERNAL	SOCKET, VOLTS = 125	ی			CARID-1		31 61		 	100 200

92CM-103907

SHARP-CUTOFF PENTODE HIGH-MU TRIODE-

Miniature type used in color and sync-clipper, phase inverter, or sound-if amplifier. Pentode unit is used in black-and-white television receivers. Triode unit is used as sync-separator,

Related 1ypes: **8N99** BGNB, 100NB output stage of video amplifier. Outline 8D, OUTLINES SECTION. Tube requires electrode capacitances, refer to type 6EB8; curve for average plate characteristics miniature nine-contact socket and may be operated in any position. For direct interof triode unit is same as for type 6EB8. Heater volts (ac/dc), 6.3; amperes, 0.75.

CLASS A: AMPLIFIER

Triode Unit Pentode Unit	330 max 330 max	- 330 max	- See curve p
Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE.	GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE,	GRID-NO.2 VOLTAGE,

30 max volts See curve page 70

Positive-bias value 0 max 0 max volt 1 max 5 max watts	volts — 1.1 max watts 65 and 330 volts — See curve page 70	athode 200 max 200 max volts 200°max 200°max volts	Triode Pantode Unit Unit Unit 250 200 volts 250 150 volts 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value PLATE DISSIPATION.	GRID-No.2 Inpur: For grid-No.2 voltages up to 165 volts For grid-No.2 voltages between 165 and 330 volts	PEAK HEATER-CATHODB VOLNGES. Heater negative with respect to cathode. Heater positive with respect to cathode.	Characteristics: Plate Supply Voltage Grid-No.2 Supply Voltage Grid-No.1 Voltage Grid-No.1 Voltage Amplification Factor Plate Resistance (Approx.) Plate Resistance (Approx.) Grid-No.1 Voltage (Approx.) Plate Cransond Cranson Grid Voltage (Approx.) Plate Cranson Grid Voltage (Approx.) Plate Current

o The de component must not exceed 100 volts. Grid-No.1-Circuit Resistance:
For fixed-bias operation
For cathode-bias operation

Maximum Circuit Yalues:

megohm megohm

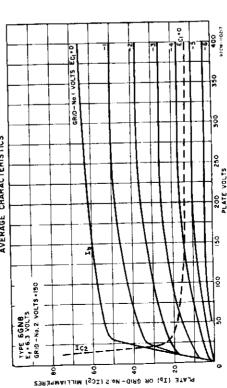
0.25 max 1 max Pentode Unit

0.5 max 1 max

Triode Unit

This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

AVERAGE CHARACTERISTICS



BEAM POWER TUBE

Related types: 12GTS, 17GTS **6G15**

Novar type used as a horizontalceivers. Outline 17A, OUTLINES contact socket and may be mounted in any position. For curve of average chardeflection amplifier in television re-SECTION. Tube requires novar nineacteristics, refer to type 6GW6.

volts amperes	สสส
6.3 1.2	0.26 15 6.5

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	cat	
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	T ec	
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CLASS A1 AMPLIFIER

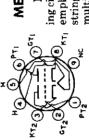
Characteristics	Triode Connection	Pentode Connection	ode ction	٠	
Plate Voltage	150	90	250	volts	
Grid-No.2 (Screen-Grid) Voltage	150	150	120	volts	
Grid-No.1 (Control-Grid) Voltage	-22.5	0	-22.5	volts	
Mu Factor, grid No.2 to grid No.1	4.4	1	1		
Plate Resistance (Approx.)	ı	ı	15000	ohms	
Transconductance	1	1	7100	Boquin	
Plate Current	1	*068	70	B	
Grid-No.2 Current	1	32*	2.1	ma	
Grid-No.1 Voltage (Approx.) for plate ma=1	1	Ι	- 42	volts	
HORIZONTAL-DEFLECTION AMPLIFIER For operation in a 555-line, 30-frame agatem	ION AMPLIFI e, 30-frame 89	ER 18tem			
Maximum Ratings, (Design-Maximum Values):					
DC PLATE SUPPLY VOLTAGE			770 max	volts	
Prak Positive-Pulse Plate Voltage			6500 max	volts	
Prak Negative-Pulse Plate Voltage			-1500 max	volts	
DC GRID-NO.2 VOLTAGE			220 max	volts	
DC GRID-No.1 VOLTAGE.			- 55 max	volts	
PEAK NEGATIVE-PULSE GRID-NO.1 VOLTAGE			-330 max	volts	
Peak Cathode Current		:	550 max	ma	
AVERAGE CATHODE CURRENT			175 max	ma	
GRID-No.2 INPUT			3.5 max	watte	
PLATE DISSIPATION.			17.5 max	watts	
PEAK HEATER-CATHODE VOLTAGE:				:	
Heater negative with respect to cathode		:	200 1002	Volts	
Heater positive with respect to cathode.			200-200	FIGA S	
BULB TEMPERATURE (At notiest point)			770 MGT	כ	
Maximum Circuit Voluet					

Grid-No.1-Circuit Resistance:

1 max megohm * These values can be measured by a method involving a recurrent waveform such that the plate dissipation and grid-No.2 input will not exceed their maximum ratings. For grid-resistor-bias operation*..

■ The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds. An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

The dc component must not exceed 100 volts.



MEDIUM-MU TWIN TRIODE

Miniature type used in the matrix-ing circuits of color television receivers employing series-connected heater strings. Also used in phase-inverter,

multivibrator, and general-purposeam-

plifier applications. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position.

volts ampere	Ā	ăă
0.6	Unit No.1 Unit No.2 3 4 3 6	0.34
	Unit No.1	Plate to Cathode and Heater Plate to Cathode and Heater Plate of Unit No.1 to Plate of Unit No.2.
	COUNTY OF THE PROPERTY OF THE COUNTY OF THE	Plate to Cathode and Heater Plate of Unit No.1 to Plate of Unit No.2
7300)	ACITANCES (Ap	ater te of Unit No.
IB (AC/DC)	DETRODE CAP	thode and Her it No.1 to Pia
HEATER VOITAGE (AC/DC) HEATER (URRENT HEATER ULANGYT	DIRECT INTERELECTRODE CAPACITANCES (Approx.): Crit to Plate. Grid to Carbode and Heater	Plate to Ca Plate of Un

CLASS As AMPLIFIER (Each Unit)

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volta volta watts	volts voits	volts volts
330 max 0 max 3 max	200 max 200 max	250 -10.5
PLATE VOLTAGE. GRID VOLTAGE, Positive-bias value. PLATE DISSIPATION.	Peak Hagrass-CATHODE VOITAGE Heater negative with respect to cathode Heater positive with respect to cathode	Characteristics: Plate Voltage Grid Voltage

obms µmhos volts ms
17 5500 3100 -23 11.5
Amplification Factor. Place Resistance (Approx.) Transconductance Grid Voltage (Approx.) for plate current of 50 µa Plate Current. Plate Current.

Maximum Circuit Yalues: Grid-Circuit Resistance:

For fixed-bias operation......

The dc component must not exceed 100 voits.

1 max megohm

92CM-- 11966T 8 AVERAGE PLATE CHARACTERISTICS EACH UNIT PLATE VOLTS TYPE 6GU7 Er = 6.3 VOLTS PLATE MILLIAMPERES \$

BEAM POWER TUBE

Related type: 17GV5 **6GV5**

twelve-contact socket and may be ceivers. Outline 16C, OUTLINES Duodecar type used as horizontaldeflection amplifier in television re-SECTION. Tube requires duodecar

(S)

mounted in any position. Heater volts (ac/dc), 6.3; amperes, 1.2.

CLASS A. AMPLIFIER

Characteristics			
Dieto Voltage	2000	60 250	
Caid No 9 (Sproon-Crid) Voltage		150 150	volts
Cata No. 1 (Control Cata) Voltogo	: 1	0 -22.5	
Dist. Desistance (Approx.)	1	- 18000	obms.
Tiggle Rehistence (Approx.)	1	- 7300	soum (
Transconductance	1	4,4*	
Plate Current.	- 34	345 65	, ma
Grid-No.2 Current.		27	
Grid-No.1 Voltage (Approx.) for plate current of 1 ma	-100	42	z volts

HORIZONTAL-DEFLECTION AMPLIFIER

For operation in a 525-line, 30-frame system	Maximum Ratings, (Design-Maximum Values):	DC PLATE SUPPLY VOLTAGE	PEAK POSITIVE-PULSE PLATE VOLTAGE®	Prak Negative-Pulse Plate Voltage	DC GRID-No.2 Voltage
	Maximum Rating	DC PLATE SUPPL	PEAK POSITIVE-P	PEAK NEGATIVE-	DC GRID-No.2 V

volts volts volts

"This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded. "Grid No.2 tied to plate; plate and grid-No.2 volts, 150; grid-No.1 volts, -22.5. PBAK NEGATIVE-PULSE GRID-No.1 VOLTAGE.... AVERAGE CATHODE CURRENT.... Plate Dissipation Heater negative with respect to cathode...... Heater positive with respect to cathode. BULB TEMPERATURE (At hottest point)...... Grid-No.1-Circuit Resistance..... PEAK HEATER-CATHODE VOLTAGE: Maximum Circuit Values: PEAK CATHODE CURRENT. DC GRID-No.1 VOLTAGE. GRID-NO.2 INPUT

volts volts

200 max 200 max 200 max

megohm

1 max

watts

17.5 max 3.5 max

volts volts E E ratts

> max maz

= Technical Data ==

-55 550 175

#The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a \$25-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

An adequate bias resistor or other means is required to protect the tube in the absence of excitation. The dc component must not exceed 100 volts.

HIGH-MU TRIODE-**POWER PENTODE**

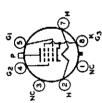
plifier and video-output applications Miniature type used for sync-am-Outline 8E, OUTLINES SECTION. Tube requires in television receivers.

be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.9. miniature nine-contact socket and may

CLASS A, AMPLIFIER

Maximum Rafinas. (Absolute-Maximum Values):	Triode $Unit$	Pentode Unit	
PLATE SUPLY VOLTAGE	550 max	550 max	volts
PEAK PLATE VOLTAGE".	1	2000 max	volts
DC PLATE VOLTAGE	250 max	250 max	volts
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE,	1	550 max	volts
GRID-No.2 Voltage		250 max	Volts
PEAK CATHODE CURRENT	200 max	ı	ma
CURRE	15 max	T6 max	8 E
GRID-No.2 INPUT.	ı	2 max	Watts
PLATE DISSIPATION	0.5 mous	7 max	watts
Frak Hatter Carrons Voltags: Heater regative with respect to cathode Heater positive with respect to cathode.	220 max 220 max	220 max	volts
Characteristics:			
Plate Voltage	100	50 65 170	volts
Grid-No.2 Voltage	1	170 210 170	voita
Grid-No.1 Voltage	8 .0–	-1 -1 -12	volts
Amplification Factor	20	1	
Mu-Factor, Grid No.1 to Grid No.2	1	7	
Plate Resistance (Approx.)	7600	25000	ohms
Transconductance	6500	7500	umhos
Plate Current	22	200*240* 41	411
Grid-No.2 Current	ı	40 50 2.7	
Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-bias operation. For cathode-bias operation. Maximum pulse duration 5 per cent of a cycle with a maximum of 1 millisecond. Maximum pulse duration 5 per cent of a cycle with a maximum of 1 millisecond. Maximum pulse duration 5 per cent of a cycle with a maximum of 1 millisecond. Maximum pulse duration 5 per cent of a larger flyback is required, this value may be reduced to 100 ma with a maximum pulse duration of 400 microseconds. This value can be measured by a method involving a recurrent waveform such that the maximum tube ratings will not be exceeded.	1 max 8.3 max 1 millisecond. required, this	1 max megohm 2.2 max negohms s value may be reduced	negohm egohms reduced aximum

BEAM POWER TUBE



	volts amperes	555
	& <u>1</u>	0.5 17
ontal- siency eceiv- SEC- et and		

6GW6 Reland types: 12GW6, 17GW6	Glass octal type used as horizontal-deflection amplifier in high-efficiency deflection circuits of television receivers. Outline 21, OUTLINES SECTION. Tube requires octal socket and may be operated in any position.	(a) (a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c
EATER VOLTAGE (AC/DC) EATER CURRENT DIRECT INTEREMEMENTATION Grid No.1 to Plate Grid No.1 to Cathod Plate to Cathode, He	IEATER VOLTAGE (AC/DC). IEATER CURRENT. DIRECT INTERELECTROBE CAPACITANCES (Approx.): Grid No.1 to Pate Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3. Plate to Cathode, Heater, Grid No.2, and Grid No.3.	0 1 0 E
Characterisics: Sate Voltage Jrid-No.2 Voltage Jrid-No.1 Voltage Jate Resistance (Approx Fransconductance Fransconductance Jrid-No.2 Current Jrid-No.2 Current Grid-No.1 Voltage (Appr	CLASS A. AMPLIFIER CONTROL CLASS A. AMPLIFIER CONTROL CLASS A. AMPLIFIER CONTROL CLASS A. AMPLIFIER CLASS A. AMPLIFIER	250 150 15000 7100 7 7 2 10

HORIZONTAL-DEFLECTION AMPLIFIER

For operation in a 525-line, 30-frame system

Maximum Ratings (Design-Maximum Values):	
Making a series of the series	
Dear Dositive-Pines Plats Voltage	
PEAR NEGATIVE-PULSE PLATE VOLTAGE	20001
SEID-NO.2 (SCREEN-GRID) VOLTAGE	:
CRID-NO.1 (CONTROL-GRID) VOLTAGE	
PEAK NEGATIVE-PULSE GRID-NO.1 VOLTAGE	# 000 · · · · ·
PEAK CATHODE CURRENT.	:
A VERAGE CATHODE CURBENT	
Grown S INDIA	10.0
PLATE DISSIPATION	
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode	:
Heater positive with respect to cathode	
BULB TEMPERATURE (At hottest point)	

ma watts watts

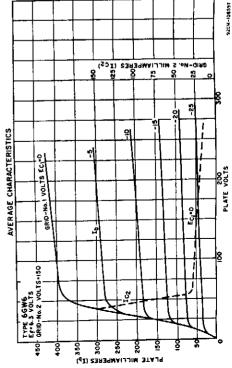
volts volts volts volts volts

volts

102

Grid-No.1-Circuit Resistance: For grid resistor-bias operation. Maximum Circuit Values:

1 max megohm



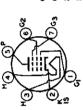
* This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

= Technical Data =

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

* An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

The dc component must not exceed 100 volts.



SHARP-CUTOFF PENTODE

as combined detector, limiter, and audio-voltage driver. Tube has two Miniature type used for FM sounddetector service in locked-oscillator, quadrature-grid FM detector circuits,

9X99 Related type: 5GX6

volts ampere seconds # #### Tube requires miniature seven-contact socket and may be mounted in any position. independent control grids, and has controlled heater warm-up time for use in circuits employing series-connected heater strings. Outline 7B, OUTLINES SECTION. $6.3 \\ 0.45 \\ 11$ 0.026 HEATER VOLTAGE (AC/DC)

HEATER VOLTAGE (AC/DC)

HEATER WARN-UT TIME (Average)

DREOT INTERELECTRODE CAPACITANCES (Approx.):

Grid No.1 to Place

Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield

Grid No.1 to Grid No.3

Grid No.1 to Cathode, Heater, Grid No.1,

Grid No.3 to Place,

Grid No.2, Decathode,

Grid No.2, Cathode,

Grid No.2, Cathode,

volts volts volts ohms ma ma volts

	volts	voits	s toy	ohme	megonm "mhos	soum	EUS.	volts		
CLASS A, AMPLIFIER	150	Grid-No.3 Supply Voltage.	3		9700	750	Plate Current.	Grid-No.3 Supply Voltage (Approx.) for plate current of 20 µa	FM SOUND DETECTOR	
į	Characteristics: Plate Supply Voltage	Grid-No. 3 Supply Vo	Grid-No.2 Supply Vo	Grid-No.1 Supply Vo	Plate Resistance (Ap	Transconductance, g Transconductance, g	Plate Current	Grid-No.3 Supply V.		

	volts	voits
	300 max	-100 max 25 max
10 10 11 10 10 W	Maximum Ratings, (Design-Maximum Values):	GRID-NO.3 (CONTROL-GRID) VOLTACE: Negative value (dc and peak ac). Positive value (dc and peak ac).

\$20M-11002F 8 GRID-NO.1 VOLTS ECI-O AVERAGE CHARACTERISTICS 200 2 PLATE VOLTS اند ភ្នំ GRID-No.3 VOLTS=0 GRID-No.2 VOLTS=100 TYPE 6GX6 Erres vocts

GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE,	IGE.	GRID-NO.1 (CONTROL-GRID) VOLTAGE:	Management of the second
KE) S	:	RID	
UPPL	Grid-No.2 Voltage.	Volt	
Š	:	AGE:	
LTAG	:		
ë.	:		
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:	:		
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GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE.	300 max	volts
GRID-NO.2 Voltage	See curv	See curve page 70
Negative-bias value.	-50 max	volts
Positive-bias value.	0 1102	volta
PLATE DISSIPATION. GRID-NO.3 INPUT	0.1 max	Watts
GRID-NO.2 INPUT: Por mid-No 9 voltages up to 150 volts	1.0 max	watt
For grid-No.2 voltages between 150 and 300 volts	See curv	See curve page 70
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode.	200 max	volts
Heater positive with respect to cathode	200 mar	volts
Maximum Circuit Values: Grid-No.3-Circuit Resistance	0.68 max megohm	megohm

Grid-No.3-Circuit Resistance Grid-No.1-Circuit Resistance: For face-bias operation For cathode-bias operation The dc component must not exceed 100 volts.

megobm megobm

0.22 max 0.47 max

AVERAGE CHARACTERISTICS

SCM-HODST PLATE VOLTS 101 ECS Ż GRID-No.2 VOLTS-100 GRID-No.1 VOLTS-0 TYPE 6GX6 PLATE (16) OR GRID-No.2 (IC2) MILLIAMPERES

SHARP-CUTOFF PENTODE

Miniature type used in gated-agcamplifier circuits and as a noise-in-Tube has two independent control grids, and has controlled heater warmverter tube in television receivers.



Volts ampere up time for use in circuits employing series-connected heater strings. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position. For curves of average characteristics, refer to type 6GX6.

6.3 0.45 11 0.026 HEATER VOLTAGE (AC/DC)
HEATER CURRENT
HEATER WARN-UF TIME (AVERAGE)
DIRECT INTERELECTRODE CAPACITANCES: Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield

•	0.12			5,5		150		100			0.14		750	
Cita is 0.1 to Campula, itemet, Grid 140.5, Grid 140.9, and Invertible Sillerd	Grid No.1 to Grid No.8.	Grid No.3 to Plate.	Grid No.3 to Cathode, Heater, Plate, Grid No.1,	Grid No.2, and Internal Shield	Characteristics: CLASS A, AMPLINER	Plate Supply Voltage	Grid-No.3 Supply Voltage.	Grd-No.2 Supply Voltage	Grid-No.1 Supply Voltage	Cathode-Bias Resistor.	Plate Resistance (Approx.)	Transconductance, Grid No.1 to Plate	Transconductance, Grid No.3 to Plate	Plate Current

Technical Data ===

ma volts volts	
4 & C- 73	
Grid-No.2 Current. Grid-No.3 Supply Voltage (Approx.) for plate current of 20 µa Grid-No.1 Supply Voltage (Approx.) for plate current of 20 µa	

GATED AGC AMPLIFIER AND NOISE INVERTER For operation in a 525-line, 30-frame system (Designe-Marinum Value).

Maximum Kalings, (Design-Maximum Values);	
PLATE VOLTAGE	300 max
FEAR FOSITIVE-FULSE FLATE VOLTAGE GRID-NO.3 (CONTROL-CRID) VOLTAGE:	600 max
Negative-bias value.	-100 max
Com-Mo 9 (argumentenn) Street Victoria	aom 0
GRID-NO.2 VOLTAGE	See curve
GRID-No.1 (CONTROL-GRID) VOLTAGE:	
Positive-hiss value	ram oc-
PLATE DISSIPATION	1 7 2007
GRID-NO.2 INPUT:	7
For grid-No.2 voltages up to 150 volts	1 max
For grid-No.2 voltages between 150 and 300 volts. PEAK HEATER-CATHODE VOLTAGE:	See curve
Heater negative with respect to cathode.	200 max
Maximum Circuit Values.	200 max
٤	
Grid-No.1-Circuit Resistance:	C. DO INGUE

volts volts volts

volts volts watts

watt page 70 volts volts

megohm

megohm megohm ■ The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds. 0.22 max 0.47 max The dc component must not exceed 100 volts. For fixed-bias operation For cathode-bias operation

HIGH-MU TRIPLE TRIODE

KT3,6T-H. ♠ 672(3)

Miniature type used in rf-ampli-

fier, mixer, and automatic-frequency-Tube requires miniature nine-contact control service in FM radio receivers. socket and may be operated in any Outline 8B, OUTLINES SECTION.

CLASS A, AMPLIFIER

position. Heater volts (ac/dc), 6.3; amperes, 0.45.

P_T2

Values are for each unit, except as noted Maximum Ratings, (Design-Maximum Values):

													4	•
330 max	0 max	2 max	5 max	100 max	100 max	Units	No.2 or No.3	125	-1	1	63	14000	4500	
		***********				Unit	No.1	125	l	220	63	_	4500	
PLATE VOLTAGE.	URID VOLTAGE, FOSIUVE-DIAS VAIUE	FLATE DISBIFATION	PEAR HEATER-CATHODE VOLTAGE (Units No.1 and No.2);	Heater negative with respect to cathode.	Heater positive with respect to cathode			Plate Supply Voltage	Grid Voltage	Cathode-Bias Resistor	Amplification Factor	Plate Resistance (Approx.)	Transconductance	
	e		PEAK HEATER-CATHODE VOLTAGE (Units No.1 and No.2):	to cathode	to cathode									
	live-bias valu		FATION CAU DE TODE VOLTAGE	with respect	with respect 1			e.			r	pprox.)		
VOLTAGE.	VOLTAGE, FOSI	Dissipation.	HEATER-CATE	eater negative	eater positive	,	Characteristics:	Supply Voltag	loitage	de-Bias Resist	fication Facto	Resistance (A	conductance.	Dieta Creament
PLATE	9 i	LATE	PEAK		5	i	Ç	Plate	Grid	Catho	Ampli	Plate	Trans	-

volts volts watts watts

volts volts

volts volts ohms

ohms µmhos ma volts

63 14000 4500 4.5

220 63 14000 4500 1.5

	٠	_	`
K02(4) (5) P0;	֡֓֞֜֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֡֓֓֓֓֓֡֓֓֡֓		(8)

voits
voits
voits
ohms
megohm

rabbos

mhhos

TWIN DIODE

Plate Current. Grid Voltage (Approx.), for plate current of 20 µa.....

בבבב

ď

type 6H6-GT used as detectors, lowvoltage rectifiers, and ave tubes. Except for the common heater, the two Metal type 6H6 and glass octal

6H6GT Related types **9H9**

other. For diode detector considerations, refer to ELECTRON TUBE APPLICAdiode units are independent of each

TIONS SECTION. Type 6H6-GT is a DISCONTINUED type listed for reference only. Heater volts (ac/dc), 6.3; amperes, 0.3.

volts volts ohms

-5 -7

= Technical Data

umhos

87 72 14500

1500

Pransconductance..... Cathode-Bias Resistor.

Amplification Factor.....

nternal-Shield Voltage...

Grid-No.1 Voltage for one-per-cent transconductance,

1 22 11.5 14500

ma

11.5

6HB6 Related type: 15HB6

	volts ma ma	volts	volts ohms ma	volts ohms ma
	420 max 48 max 8 max	330 maz 330 maz	150 4.0 8	Full-Wave 117 15
			117 15 8	Half-Wave 117 30 8
RECTIFIER OR DOUBLER		odede.	fler*; dance (Per Plate)*	ince (Per Plate)°
	Peak Inverse Plate Voltage Peak Plate Current (Per Piste) De Output Current (Per Piste)	Ext. EastPract_Arthory of Volfade: Heater negative with respect to cathode Heater positive with respect to cathode	Typical Operation As Half-Wave Rectifler*; AC Plate Voltage (Per Plate, rms) Min. Total Effective Plate-Supply Impedance (Per Plate)* DC Output Current (Per Plate)	Typical Operation As Voltage Doubler: AC Place Voltage (Per Plate, rms) Min. Total Effective Plate-Supply Impedance (Per Plate) DC Output Current. 8
Maximum Ratings:	PEAK INVER PEAK PLATE DC OUTPUT	FEAR DEATH Heater Deater Deate	Typical Ope AC Plate Vo Min. Total I DC Output	Typical Operated AC Plate Vomen Min. Total I

• When a filter-input capacitor larger than 40 μf is used, it may be necessary to use more plate-supply * In half-wave service, the two units may be used separately or in parallel.

impedance than the value shown to limit the peak plate current to the rated value.

INSTALLATION AND APPLICATION

Types 6H6 and 6H6-GT require an octal socket and may be mounted in any position. Type 6H6-GT may be supplied with pin No.1 omitted. Type 6H6 maximum dimensions: over-all length, 1-3/4 inches; seated height, 1-3/16 inches; diameter, 1-5/16 inches. Type 6H6-GT, Outline 14C, OUTLINES SECTION.

For detection, the diodes may be utilized in a full-wave circuit or in a halfprovide approximately twice the rectified voltage as compared with the full-wave wave circuit. In the latter case, one plate only, or the two plates in parallel, may be employed. For the same signal voltage, the use of the half-wave arrangement will arrangement. For automatic volume control, the 6H6 and 6H6-GT may be used in circuits similar to those employed for any of the twin-diode types of tubes. The only difference is that the 6H6 and 6H6-GT are more adaptable because each diode has its own separate cathode.



HIGH-MU TRIODE

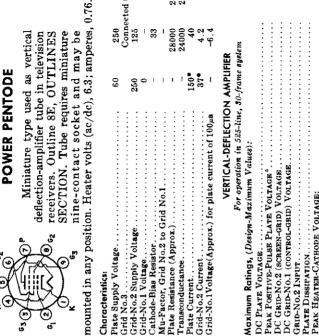
Miniature type used as rf-amplifier tube in vhf television tuners. Outline 7A, OUTLINES SECTION, except vertical dimensions are 1/8 inch shorter. Tube requires miniature seven-

Related type:

3HA5

contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.18.

Maximum Ratings, (Design-Maximum Values): 220 max DC PLATE Voltage. 500 max DC PLATE SUPPLY VOLTAGE. 500 max GRID VOLTAGE. 50 max CATHODE CURRENT. 22 max PLATE DISSIPATION 26 max PEAK HANTER-CATHODE VOLTAGE: 110 max Heater negative with respect to cathode. 110 max Characteristics and Typical Operation: Pixed Bias Cathode Bias Characteristics and Typical Operation: Pixed Bias Cathode Bias DC Plate Supply Voltage. 135 135 135 Plate-Load Remistor 1000 5600	CLASS A, AMPLIFIER	LIFIER		
220 maz 600 maz 600 maz 2 maz 2 maz 2 6 maz 110 maz	Maximum Ratings, (Design-Maximum Values):			
500 max	DC PLATE VOLTAGE			×
-50 maz 22 maz 22 maz 2.6 maz 110 maz 110 maz 115 135 135 135 135 135 2 1000 5600	DC PLATE SUPPLY VOLTAGE,			•
22 max 2.6 max 110 max 110 max 110 max 135 135 135 - 1000 5600	GRID VOLTAGE			
2.6 max 110 max 110 max 110 max 135 135 135 - 1000 5600	CATHODE CURRENT.			
110 max 110 max 110 max Fixed Bias Cathode Bias 135 135 135 - 1000 5600	PLATE DISSIPATION.			W.B
110 max Fixed Bias Cathode Bias 135 135 135 135 - 1000 5600	o cathode			
Fixed Bias Cathode Bias 135 135 135 135 - 1000 5600	:			3
	Characteristics and Typical Operation: DC Plate Supply Voltage. Plate-Load Resistor	Fixed Bias 135 135	Cathode Bias 135 135 1000 5600	- 0



VERTICAL-DEFLECTION AMPLIFIER		- 6
=	쁦	7
=	AMPLII	factors.
VERTICAL-DEFLECTIO	ž	5
Fz	VERTICAL-DEFLECTION	on onesting in 505 line
		F

ohms mhos ma

100 33 24000 20000

33 28000 24000 Ħ

Connected to cathode at socket 125 250 volts

250

volts ohma

aximum Ratings, (Design-Maximum Values):		
C Plate Voltage	350 max	volts
AAK POSITIVE-PULSE PLATE VOLTAGE"	2500 max	volts
C GRID-No.2 (SCREEN-GRID) VOLTAGE	300 max	volts
C GRID-NO.1 (CONTROL-GRID) VOLTAGE	-100 max	volts
RID-No.2 Input	2 max	watts
ATE DISSIPATION.	10 max	watts
eak Heater-Cathode Voltage:		
Heater negative with respect to cathode	200 max	volts
Heater positive with respect to cathode	200 max	volts

Grid-No.1-Circuit Resistance: Maximum Circuit Values:

• Intervalue can be measured by a method involving a recurrent waveform such that the maximum tube ratings will not be exceeded.
• The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 528-line, 30-frame system, 15 per cent of one vertical-ecanning cycle is 2.5 milliseconds.
■ The dc component must not exceed 100 volts.

BEAM POWER TUBE

Duodecar type used as verticaldeflection amplifier in television receivers. Outline 12D, OUTLINES SECTION. Tube requires duodecar

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olts olts ma etts

olts

olts IIIs

298

mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.8. twelve-contact socket and may be

CLASS A, AMPLIFIER

Characteristics:			
Plate Voltage. Grid-No.2 (Screen-Grid) Voltage.	250 250	250 250	volts volts
			299

rid-No.1 (Control-Grid) Voltage Tan Resistance (Approx.) Tate Current. Tate Current. Tid-No.2 Current. Tid-No.1 Voltage (Approx.) for plate current of 100 µa.
--

VERTICAL DEFLECTION AMPLIFIER

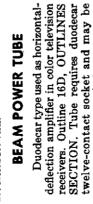
		350 max
For operation in a 525-line, 30-frame system	mum Ratings, (Design-Maximum Values):	LATE VOLTAGE.

Ackimum Ratings (Design-Marimum Values).		
C PLATE VOLTAGE	350 max	volts
EAR POSITIVE-PUISE PLATE VOLTAGE#	2500 max	volts
RID-NO.2 VOLTAGE	300 max	volts
BAK CATHODE CURRENT	260 mar	ETI.
VERAGE CATHODE CURRENT	75 max	m8
LATE DISSIPATION	12 max	watts
BID-No.2 Input	2.75 max	watts
EATER-CATHODS VOLTAGE:		
Heater negative with respect to cathode	200 max	volts
Heater positive with respect to cathode	200 max	volts
ULB TEMPERATURE (At hottest point)	200 max	ပ္

This value can be measured by a method involving a recurrent waveform such that the maximum ratrid-No.1-Circuit Resistance: For fixed-bias operation... For cathode-bias operation **Naximum Circuit Values:**

The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-ne, 80-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds. An adequate bias resistor or other means is required to protect the tube in the absence of excitation. igs of the tube will not be exceeded.

The dc component must not exceed 100 volts.



¥;; (2)

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Characteristics: Characteristics: Characteristics:	MPLIFIER			
Plate Voltage.	2000	70	175	volts
Brid-No.2 (Screen-Grid) Voltage	125	125	125	volts
Frid-No.1 (Control-Grid) Voltage	1	•	-25	volts
Priode Amplification Factor.	1	ı	*	
Plate Resistance (Approx.)		ı	2600	ohme
[ransconductance]		1,	11300	soum
Nate Current		570	125	ma.
Frid-No.2 Current.		34	4.5	ma
Frid-No.1 Voltage (Approx.) for plate current of 1 ma	ıs –140	ı	-54	volts
CHILDREN TO THE PROPERTY OF TH	2117 11012			

HORIZONTAL-DEFLECTION AMPLIFIER For operation in a 525-line, 30-frame system

haximum Ratings, (Design-Maximum Values):

PLATES ENTRE PARAGE PARK POSITIVE-PULSE PLATE VOLTAGE PARK NEGATIVE-PULSE PLATE VOLTAGE OG GRID-NO.2 VOLTAGE PEAK NEGATIVE-PULSE GRID-NO.1 VO PAKE CATHODE CURRENT AVERAGE CATHODE CURRENT PEAK BARRENCON PARK CATHODE CURRENT RATE DISSIPATION RATE DISSIPATION HEAVE PORGITIVE WITH respect to of HEAVE PROSITIVE WITH respect to of HEAVE PROSITIVE WITH respect to of HEAVE PROSITIVE WITH respect to of BUIR TEMPERATURE (At hottest point		PRAK POSITIVE-PULSE PLATE VOLTAGE# (Absolute Maximum) 75004max	OLTAGE.		T				BRID-No.2 INPUT		Heater negative with respect to cathode		BULB TEMPERATURE (At hottest point)
--	--	--	---------	--	---	--	--	--	-----------------	--	---	--	-------------------------------------

3rid-No.1-Circuit Resistance.

Orid No.2 tied to plate and grid-No.2 volts, 125; grid-No.1 volts, -25.

This value can be measured by a method involving a recurrent waveform such that the maximum satings of the tube will not be exceeded.

Kaximum Circuit Value:

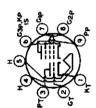
The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 225-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

Under no circumstances should this absolute value be exceeded.

An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

The de component must not exceed 100 volts.

= Technical Data =



SHARP-CUTOFF PENTODE HIGH-MU TRIODE-

Miniature type used in color and black-and-white television receivers. The triode unit is used in high-gain, sound-if stages and in sync-separator,

Related type: 10HFB

sync-clipper, and phase-inverter cir-

cuits; pentode unit is used as video-output amplifier. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be operated in any position. For curves of average characteristics, refer to type 6AWS-A for the triode unit and to type 6EB8 for the pentode unit.

HEATER VOLTAGE (AC/DC)	60	volts
Heater Cuerent.	0.75	ат повти
DIRECT INTERELECTRODE CAPACITANCES:		
Triode Unit:		
Grid to Plate	ed re	ī
Grid to Cathode, Heater, Pentode	?	i,
Cathode, Grid No.3, and Internal Shield	or es	4
Plate to Cathode, Heater, Pentode Cathode.	·	ī,
Grid No. 3, and Internal Shield	9 6	ř
Pentode Unit:	•	ī,
Grid No.1 to Flate	0 1 222	ž
Grid No.1 to Cathode, Heater, Grid No.2.		1,
Grid No.8, and Internal Shield	10	Ë
Plate to Cathode, Heater, Grid No.2,		i,
Grid No.3, and Internal Shield	4.2	ď
Triode Grid to Pentode Plate	0.015 max	ā
		,

CLASS A, AMPLIFIER			
Maximum Ratings, (Design-Maximum Values):	Triode Unit	Triode Unit Pentode Unit	
PLATE VOLTAGE. Grid-No.2 (screen-grid) Supply Voltage.	330 max _	330 max 330 max	volts
GRID-NO.2 VOLTAGE. GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value.	0 max	See curve page 70 0 max volts	page 70 volta
PLATE DISSIPATION. GRID-NO.2 INPIT:	1 max	5 max	watts
For grid-No.2 voltages up to 165 volts	1	1.1 max	watte
PRAK HEATER-CATHODE VOLTAGE:	1	see curve page 70	nz a ze d
Heater negative with respect to cathode.	200 max	200 max	volts
Heater positive with respect to cathode	200 mar	200	100

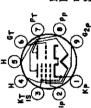
Heater negative with respect to cathode. Heater positive with respect to cathode.	200 max 200™max	200 max 200™nax	volts
Characteristics: Triode Unit	Pentod	Pentode Unii	
Plate Supply Voltage.	45	200	volts
Grid-No.2 Supply Voltage	125	125	Volts
Grid-No.1 Voltage	Φ	1	volts
Cathode-Bias Resistor.	I	89	ohme
Amplification Factor. 70	ı	1	
Piate Resistance (Approx.)17500	ı	75000	ohme
Transconductance4000	ı	12500	ampos
Plate Current.	40	25	EMB
Grid-No.2 Current	15	(-	401
Grid-No.1 Voltage (Approx.) for plate current of 100 µa -	1	G.	Volta
Grid-No.1 Voltage (Approx.) for plate current of 20 µa -6	I	I	volts

alves:	esistance:
Circuit V	Circuit R
Maximum	Grid-No.1-

voits voits voits voits ma ma ma watts

Triode Unit Pentode Unit	c 0.25 max megohm	such that the maximum	
Triode Un	0.5 max 1 max	t waveform	
Grid-No.1-Circuit Resistance:	For fixed-bias operation For cathode-bias operation	 This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded. 	The de commonent miss not exceed 100 volts

volts CC



Miniature type with frame-grid SHARP-CUTOFF PENTODE

MEDIUM-MU TRIODE—

lator and mixer tube in vhf television pentode unit used as combined oscil-SECTION. Tube requires miniature Outline 8B, OUTLINES receivers.

nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.34.

CLASS A, AMPLIFIER

1 But = a (Trains Mondonino Vitters);	Triode Unit	Pentode	
	125 max	250 max	volts
PLATE VOLTAGE. CRID. NO.2 (SCREEN-GRID) VOLTAGE.	. 1. 1	150 max	volts
,	15 max	18 max	
	1.5 max	z mar	Watte
GRID-NO.2 INPUT			
o cathode	100 max	100 max	voits
	100 maz	100 max	volts
Characteristics			
	100	170	volts
	ı	150	volts
	9	-1.2	volts
	17	1	
Amplification Pactor	: 1	70	
Factor, Grid No. a Cond Ind.	1	0.35	megohm
Flate Kealstance (Approx.)		12000	mpos
		10	ETH
Links Currents		60	mR

SHARP-CUTOFF PENTODE DIODE-



video-detector and if-amplifier tube in connected heater strings. Outline 8B, television receivers employing series-

quires miniature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.45; warm-up time (average), 11 seconds.

PENTODE UNIT AS CLASS As AMPLIFIER

Maximum Ratings, (Design-Maximum Values): PLATE VOLVAGE PLATE VOLVAGE GRID-NO.2 (SCREEN-CRID) SUPPLY VOLVAGE, Positive-bias value GRID-NO.2 (SCREEN-CRID) SUPPLY VOLVAGE, Positive-bias value GRID-NO.2 INPUT: GRID-NO.1 (CONTROL-CRID) VOLVAGE, Positive-bias value For grid-No.2 voltages between 165 and 330 volts FLATE DISSIPATION CHART HEATER-CATHODE VOLVAGE: Charter negative with respect to cathode Charter negative with respect to cathode Charter positive with respect to cathode Charter positive with respect to cathode Charter positive with respect to cathode Charter negative with respect to cathode Charter positive with respect to cathode Transconductance Transconductance Transconductance Plate Resistance (Approx.) Plate Current Grid-No.2 Current Grid-No.2 Current Grid-No.2 Current Grid-No.2 Current Grid-No.2 Current Grid-No.1 Voltage (Approx.) for plate current of 20 µa Grid-No.1 Voltage (Approx.) for plate current of 2 ma and Grid-No.1 Voltage (Approx.) for plate current of 2 ma and Grid-No.1 Voltage (Approx.) for plate current of 2 ma and Grid-No.1 Voltage (Approx.) for plate current of 2 ma and Grid-No.1 Voltage (Approx.) for plate current of 2 ma and Grid-No.1 Voltage (Approx.) for plate current of 2 ma and Grid-No.1 Voltage (Approx.) for plate current of 2 ma and Grid-No.1 Voltage (Approx.) for plate current of 2 ma and Grid-No.1 Voltage (Approx.) for plate current of 2 ma and and avoltage (Approx.) for plate current of 2 ma and avoltage (Approx.) for plate current of 2 ma and avoltage (Approx.) for plate current of 2 ma and avoltage (Approx.) for plate current of 2 ma and avoltage (Approx.) for plate current of 2 ma and avoltage (Approx.) for plate current of 2 m
Kampan se dassaganses

= Technical Data ==

m	voits	volta
5 max	200 max 200 °max	10
Maximum Rafings, (Design-Maximum Values): DC Plate Current	PEAK HEAFER-CATHODE VOLTAGE: Heater negative with respect to cathode	Characteristics, Instantaneous Value: Tube Voltage Drop for plate current of 50 ma

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

Miniature type used in a wide variety of applications in television reheater strings. The triode unit is used as a sync-separator or voltage-ampliceivers employing series-connected

contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; fier tube, and the pentode unit is used as a video if-amplifier, agc-amplifier, or reactance tube. Outline 8B, OUTLINES SECTION. Tube requires miniature nineamperes, 0.6; warm-up time (average), 11 seconds.

CLASS A: AMPLIFIER

megohm megohm

0.25 max 0.5 max

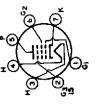
0.5 max

For cathode-bias operation

Grid-No.1-Circuit Resistance: For fixed-bias operation. Maximum Circuit Values:

	Triode	Pentode		
Moximum Ratinas. (Design Maximum Values):	Unit	Unit		
Drawa Voltake	330 max	330 max	volts	
Com-No 2 (SCREEN-GRID) Supply VOLTAGE	ı	330 max	volts	
CRIENO 2 VOLTAGE	1	See curv	See curve page 70	
GRID)	0 max	0 max	volts	
PLATE DISSIPATION.	2.5 max	2.5 max	watts	
GRID-NO.2 INPUT:				
For grid-No.2 voltages up to 165 volts	1	0.55 max	Watt	
For grid-No.2 voltages between 165 and 330 volts.		See curv	See curve page 70	
PEAK HEATER-CATHODE VOLTAGE:				
Heater negative with respect to cathode	200 max	200 max		
Heater positive with respect to cathode	200 max	200 max	volts	
Characteristics				
Plete Voltage	125	125	volts	
	ı	125	volts	
Grid-No.1 Voltage	7	7	volt	
Amplification Factor	40	ı		
Plate Registance (Approx.)	2000	150000	ohms	
Transconductance	7000	10000	mhos	
Plate Current	12.5	12	m.	
Grid-No.2 Current.	1	4.5	#1H	
Grid-No.1 Voltage (Approx.) for plate current of 20 µs	I	! -	volts	
Maximum Circuit Values:				
Grid-No.1-Circuit Resistance	1 max	1	megohm	
• The dc component must not exceed 100 voits.				

SEMIREMOTE-CUTOFF PENTODE



line 7B, OUTLINES SECTION. Tube fier tube in FM receivers employing Miniature type used as if-ampliet and may be mounted in any position. series-connected heater strings. Outrequires miniature seven-contact sock-

6HR6 Related type:

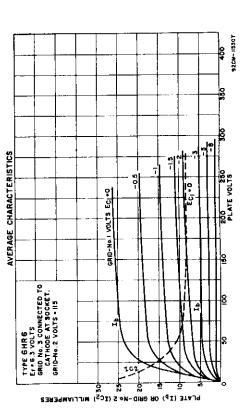
ampere 3036.3

<u>volta</u>

Heater Voltage (ac/dc)...... HEATER CURRENT,,,,,,,,,,,

= RCA Receiving Tube Manual =

HEATER WARM-UP TIME (Average)	11	seconds
	0.006 max	ď
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield.	8 0,	jd
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield.	2 5	Jd
CLASS A. AMPLIFIER		
Maximum Ratings, (Design-Maximum Values):		
PLATE SUPPLY VOLTAGE	300 max	volts
CRIP-NO.3 (SUPPRESSOR-CRID) VOLTAGE, Positive value	0 max	volts
GRIP-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE.	300 max	volts
GRID-NO.2 VOLTAGE.	See curv	See curve page 70
GRID-No.1 (CONTROL-GRID) VOLTAGE:		-14-
Negative-bias value	-50 max	VOILS
Positive-bias value.	3 1202	watte
GRID-NO.2 INPUT:		:
For grid-No.2 voltages up to 150 volts.	1 max	watt
For grid-No.2 voltages between 150 and 300 volts	See curv	see carve page 10
Heater negative with respect to cathode. Heater positive with respect to cathode.	200 max 200 max	volts volts



Characteristics: Dista County Voltage	200 volts
Trace Supply of the at socket Connected to cathode at socket	to cathode at socket
Grid-No.2 Supply Voltage	115 volts
Grid-No.1 Supply Voltage	0 volts
Cathode-Bias Resistor.	68 ohms
Plate Resistance (Approx.)	0.5 megohm
Transconductance	8500 µmhos
Grid-No.1 Voltage (Approx.) for transconductance of 60 µmhos	-15 volts
Plate Current	13.2 ma
Grid-No.2 Current.	4.3 ma

= Technical Data =



SHARP-CUTOFF PENTODE

Miniature type used as if-amplifier and limiter tube in FM receivers.

6HS6	Š
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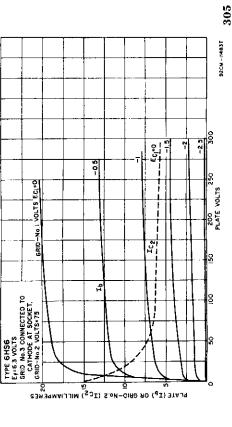
OTCO Related type: 19456	6.3 volts	45 ampere	11 seconds		0.006 max pf		8.8 pf		5.2 pf		
outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position.	HEATER VOLTAGE (AC/DC)	HEATER CURRENT	HEATER WARM-UP TIME (AVERAGE)	DIRECT INTERBLECTRODE CAPACITANCES:	Grid No.1 to Plate	Grid No.1 to Cathode, Heater, Grid No.2,	Grid No.3, and Internal Shield8	Plate to Cathode, Heater, Grid No.2, Grid No.3,		CLASS A. AMPLIFIER	A

JACE, Positive Value. 300 max volts Outsage. Voltade. 300 max volts	See curve par -50 max	0 max volts 8 max watts	50 volts	o cathode
PLATE SUPPLY VOLTAGE. GRID-NO.3 (SUPPRESSOR-CRID) VOLTAGE, Positive Value. GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE.	GRID-NO.2 VOLTAGE. GRID-NO.1 (CONTROL-GRID) VOLTAGE: Negative-has value.	Positive-bias value. Plate Dissipation. Grid-No.2 Input:	For grid-No.2 voltages up to 150 volts. For grid-No.2 voltages between 150 and 300 volts. Peak Heater CATHODE VOLTAGE:	Heater negative with respect to cathode

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.55
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-
o
_
U

Plate Supply Voltage	7.5	150	volts
Grid No.3.	Connected	Connected to cathode at socket	at socket
Grid-No.2 Supply Voltage.	75	75	volta
Grid-No.1 Supply Voltage.	0	0	volts
Cathode-Bias Resistor.	68	89	ohma
Amplification Factor.	50	1	
Plate Resistance (Approx.)	t	0.5	megohm
Transconductance	ı	9500	#mhos
Plate Current	ı	90 90	ECT.
Grid-No.2 Current	ı	8.	ma
Grid-No.1 Voltage (Approx.) for plate current of 20 µs	1	4-	volts

AVERAGE CHARACTERISTICS



The de component must not exceed 100 volts.

megohm megohm

0.5 max 1 max

Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation

Maximum Circuit Values:

For fixed-bias operation.... Grid-No.1-Circuit Resistance:

megohm megohm

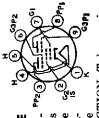
0.5 max 1 max

The dc component must not exceed 100 volts.

For eathode-bias operation.....

Triode connection (grid No.2 connected to plate).

Related typ 3HS8, 4HS



Ø miniature ni unit is used

SHARF-COLOFF IWIN FEMIODE	
fier, sync, and noise-limiting circuits	
television receivers. One pentode	
it is used as combined sync separa- and sync clipper; second pentode	×ر ا
as agc amplifier. Outline 8D, OUTLINES SECTION. Tube requires	FION. Tube required
ine-contact socket and may be operated in any position.	osition.
	. 6.3 volts
ENT	. 0.3 ampere

Grid No.3 to Plate (Each Unit).
Grid No.1 to All Other Electrodes
Grid No.3 (Each Unit) to All Other Electrodes
Plate (Bach Unit) to All Other Electrodes.
Grid No.3 (Unit No.1) to Grid No.3 (Unit No.1) Heater Current.

Direct Interelectrode Capacitances: HEATER VOLTS

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₹
Κ.
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Maximum Ratinas, (Deston-Maximum Values):	winnum Values):	
PLATE VOLTAGE (Each Unit).	PLATE VOLTAGE (Each Unit).	300 max
GRID-NO.5 (SUPPRESSOR-GRID) VOLINGE (Lacis Circ). Peak nonitive value.	D-No.s (Suppressor-exid) yourge (mach only). Peak noritive value.	50 max
DC negative value	DC negative value.	-50 max
GRID-NO.2 (SCREEN-GRID) VOL	DC positive value	150 max
GRID-NO.1 (CONTROL-GRID) VO	GRID-No.1 (CONTROL-GRID) VOLTAGE, Negative-bias value	-50 max
CATHODE CURRENT	CATHODE CURRENT	12 max
FLATE DISSIPATION (Each Online GRID-NO.2 INPUT	FLATE DISSIPATION (Each Unit)	0.75 max
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to Heater positive with respect to	к Неатеж-Сатноре Vollage: Heater negative with respect to cathode	200 max 200≡max
Characteristics	With One Unit Operating	

volts volts volts

/olts

ma watts

watt

volts volts

volts volts

001

900

AVERAGE CHARACTERISTICS

Plate Voltage. Grid-No.3 Voltage.

92CM - 6033F Ī 8, GRID-NO. I MILLIAMPERES IC; GRID-No.1 VOLTS 200 PLATE VOLTS 1 GRID - No. 3 VOLTS = O GRID - No. 2 VOLTS = 67.5 PLATE AND GRID No. 3 OF OTHER UNIT GROUNDED. TYPE 6HSB 83R39MAIJJIM 3TAJ9

volta volta µmbos µmbos	ma volts	volta	volts volts	volts ma	ma ma
67.5 	 & & & & & &	100	67.5	□ 6 1	4.8
67.5 0 - 1100	1 1	100	-10	□ l	7.1
Grid-No.2 Voltage. Grid-No.1 Voltage. Transconductance, Grid-No.3-to-Plate Transconductance, Grid-No.1-to-Plate	Plate Current. Grd-No.3 Voltage (Approx.) for plate current of 100 µa. Grd-No.1 Voltage (Approx.) for plate current of 100 µa.	With Both Units Operating Plate Voltage (Each Unit)	Grid-No.3 Voltage (Each Unit). Grid-No.2 Voltage.	Grid-No.1 Voltage Plate Current (Each Unit)	Grid-No.2 Current.

= Technical Data

The dc component must not exceed 100 volts.

Maximum Circuit Values:

megohm megohm

0.5 max 0.5 max

With plate and grid No.3 of other unit connected to ground.

DAdjusted to give grid-No.1 current of 0.1 milliampere

ヹヹヹヹ

0.015 max

AVERAGE CHARACTERISTICS TYPE 6HS8 E, 6.3 VOLTS 6RIO - No. 2 VOLTS - 67.5 GRID - No. 1 MILLIAMPERES - 0.5 PLATE AND GRID NO. 3 OF OTHER UNIT GROUNDED. 2.3

SHARP-CUTOFF PENTODE

tector tube in FM and television receivers employing series-connected heater strings. Tube has two independ-Miniature type used as sound-de-

LINES SECTION. Tube requires miniature seven-contact socket and may be ent control grids. Outline 7B, OUT-

mounted in any position. Heater Voltage (ac/DC).	æ.	volts
HEATER CURRENT.	0.45	ampere
Heater Warm-up Time (average)	11	seconds
DIRECT INTERELECTRODE CAPACITANCES (Approx.):		•
Grid No. 1 to Plate	0.023	ă
Grid No.1 to Cathode, Heater, Grid No.2, Grid No. 3, and Internal Shield	80.53	ď
Grid No.1 to Grid No.3.	0.0	ă

92CM-4771T

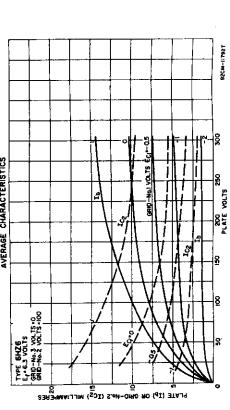
Manual
Tube
eceiving
RCA R
П

= Technical Data =

Grid No.3 to Plate.	1.6	ă
Grid No.3 to Cathode, Heater, Grid No.1, Grid No.2, Flate, and Internal Shield.	7.2	þĮ
CLASS A, AMPLIFIER		
Choracteristics: Plate Supply Voltage	150	volts
Grid-No.3 Supply Voltage.	100	volts
Grid-No.1 Supply Voltage	•	volts
Cathode-Bias Resistor.	180	ohras
Fighte Resistance (Approx.)	3400	"Tahoe
Transconductance, Grid No.3 to Plate.	909	soqua _d
Plate Current.	69 6 69 6	E
Grid-No.3 Supply Voltage (Approx.) for plate current of 20 µs.	\$ E-	volts
Grid-No.1 Supply Voltage (Approx.) for plate current of 20 µa	4.5	volts
FM SOUND DETECTOR		
ign-Maximum Values):	300 max	volts
Card Voltage Grid-No.3 (Control-Grid) Voltage:		
	-100 max	volta
Positive value (do and peak ac)	300 max	volts
GRID-No.2 Voltage	See curve	See curve page 70
GRID-No.1 (CONTROL-GRID) VOLTAGE: Nometive-biss welte	-50 max	volts
Positive-bias value	0 max	volta
PLATE DISSIPATION.	1.7 max 0 1 max	watte
GRID-NO.2 INPUT:		
For grid-No.2 voltages up to 150 and 800 volts	See curv	See curve page 70
PEAK HEATER-CATHODE VOLTAGE:	000	*
Heater negative with respect to calhode	200 max	volts
	0 68 2002	mego
Grid-No.1-Circuit Resistance:		
For fixed-bias operation. For cathode-bias operation.	0.22 max 0.47 max	megohm

AVERAGE CHARACTERISTICS

The de component must not exceed 100 volts.



6J5G1 Related type: 615 12,15GT BZCM-(1793T Metal type 6J5 and glass octal type 6J5-GT used as detectors, amplifiers, or oscillators in radio equipment. MEDIUM-MU TRIODE AVERAGE CHARACTERISTICS PLATE YOUTS VO TS ECS TYPE 6HZ6 E, 6.3 VOLTS GRID-No.2 VOLTS = 100 GRID-No.1 VOLTS = 0 S:6.35 BC:6.15-GT PLATE $(\mathbf{I}_{\mathbf{D}})$ OR GRID-NO.2 $(\mathbf{I}_{\mathbf{C}2})$ MILLIAMPERES

These types feature high transconduct-

Tubes require octal socket and may be mounted in any position. For typical operation as resistance-coupled amplifiers, refer to RESISTANCE-COUPLED AMPLIFIER SECTION. Type 6J5-GT is used principally for renewal purposes. 85.815-57 ance together with comparatively high amplification factor. Outlines 2 and 14C, respectively, OUTLINES SECTION

volts בַּבַ בַ ашреге 6.3 0.8 6J5-GT** cathode, Heater Voltage (ac/dc). Heater Current
 Grid to Plate
 3.4

 Grid to Cathode and Heater
 3.4

 Plate to Cathode and Heater
 3.4

 Plate to Cathode and Heater
 3.6

 hell connected to cathode
 **Base sleeve and external shield connected to
 ABANIER CURRENT (1978) (Aprice): 615* 615* 615* * Shell connected to cathode.

AVERAGE PLATE CHARACTERISTICS TYPE 6.35 E e=6.3 VOLTS PLATE MILLIAMPERES

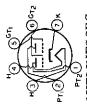
CLASS A, AMPLIFIER Maximum Ratings, (Design-Center Values):

0 max 20 max 10 max 10 max	volts watts ma volts
9	volts
œ	voits
35	6mqo
	empos
	volts
6	ma
.0 max m	ndoge
	2.5 max volts 2.5 max watts 2.0 max watts 90 max volts 90 max volts 250 volts 260 ohms 7700 ohms 2600 mminos -18 max megohm

MEDIUM-MU TWIN TRIODE

rangement of the grids and the plates Miniature types used as combined rf power amplifier and oscillator or as twin af amplifier. With push-pull arin parallel, can also be used as a mixer

Related types: 516, 1916 **6**J6A 979



at frequencies as high as 600 megacycles per second. Outline 7B, OUTLINES SECTION. Tubes require miniature seven-contact socket and may be mounted in any position. Type 616 is a DISCONTINUED type listed for reference only.

volts ampere seconds	dada
6.3	With Externa Shield 2.6 2.6 1.6
	Without External Shield 2.2 0.4 0.4
Heater Voltage (ac/dc). 6.3 Heater Curren. 1 1.1 Haater Waran (1 Time (A verse) for 616.4	DIRECT INTERELECTRODE CAPACITANCES (Each Unit, Approx.): Grid to Plate Grid to Cathode and Heater (Unit No.1) Plate to Cathode and Heater (Unit No.1) Plate to Cathode and Heater (Unit No.2)

CLASS A, AMPLIFIER (Each Unit):

800 max volts 0 max volts 1,5 max watta 100 max volts 100 max volts	100 volts 501 obms 38 obms 7100 obms 6300 mmbos 8.5 ma	Not recommended 0.5 max megohm
Maximum Ratings, (Design-Center Values): PLATE VOLTAGE GRID VOLTAGE, POSITIVE-BIBS VALUE PLATE DISSURATION PLATE HATTER-CATHODE VOLTAGE; PLATE DISSURATION HEATER TORGIVE WICH respect to cathode. Heater positive with respect to cathode.	Characteristics. Plate Voltage Cathode-Blas Resistor Amplification Factor Plate Resistance (Approx.) Transconductance Plate Current	Maximum Circuit Values: Grid-Circuit Resistance: For fixed-bias operation For cachode-bias operation † Value is for both units operating at the specified conditions:

RF POWER AMPLIFIER AND OSCILLATOR—Class C Telegraphy

		volts			volts
ı		300 max	4	-40 max	U max
Key-down conditions per tube without modulation	Maximum Ratings, (Design-Center Values, Each Unit):	PLATE VOLTAGE,	GRID VOLTAGE:	Negative-bias value	Positive-bias value.

cathode	PLATE DISSIPATION 1.5 max
Typical Push-Pull Operation (Both Units):	PEAK HEATER-CATEOBY OUT-DEBY BY THE PEAK HEATER-CATEORY THE REAL REGISTRY WITH respect to eathode. Heater positive with respect to eathode. Towical Push, Pull Operation (Rath Units):

6.17	6J7G	- 5 / Feb.	12J7GT	wal purposes. Type	l types require octal), 6.3; amperes, 0.3.
SHARP-CUTOFF PENTODE	Metal type 6J7 and glass octal types 6J7-G and 6J7-GT are used as	biased detectors or high-gain audio	3, 23, and 15A, respectively, OUT-	LINES SECTION. Type 6J7-GT is used principally for renewal purposes. Type	6J7-G is a DISCONTINUED type listed for reference only. All types require octal	ounted in any position. Heater volts (ac/d $^{\circ}$
**************************************			15:577-6 C	LINES SECTION.	6J7-G is a DISCON	socket and may be m

CLASS A, AMPLIFIER		
Maximum Rafings, (Design-Center Values): PLATE VOLTAGE GRID-NO.2 (SCHERH-GRID) VOLTAGE GRID-NO.2 SUFFLY VOLTAGE GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value PLATE DISSIPATION	300 max See curve 300 max 0 max 0.75 max	volts verse 70 volts volts
GRID-VOZ INPUT: For grid-No.2 voltages up to 160 volts. For grid-No.2 voltages up to 160 and 300 volts.	0	10 max watt See curve page 70
Heater negative with respect to cathode. Heater positive with respect to cathode.	90 max 90 max	volts
	100 250 Connected to cathode at socket	-
Grid-No.2 Voltage.	00 m *	volta
<u>-</u>	1225 -7	raegonta prohos volts
	6 64 89	
Maximum Circuit Yalve: Grid-No.1-Circuit Resistance	1.0 max	megohm
CLASS At AMPLIFIER (Triode Connection)		
Maxmur Kuings, Loegh-Comp. PLATE VOLTAGE. GRID-No.1 Voltage. PLATE DISSIPATION (TOTAL).	250 max 0 max 1.75 max	volts volts watts
Peak Heater-Cathods Voltage: Heater negative with respect to cathode. Heater positive with respect to cathode.	90 max	volts volts
Characteristics Plate Voltage Grid-No.1 Voltage - 6.3	320 -8 -8	volts volts
Amplification Factor Plate Resistance (Approx.) Transconductance Plate Current 1800 Plate Current 5.8	10500 1900 6.5	ohma pmhos ma
Maximum Circuit Value: Grid-No.1-Circuit Resistance	1.0 max	megohm
* Grida No.2 and No.8 connected to plate.		311

6,18G

oscillator and heptode mixer in radio receivers. Outline 23, OUTLINES SECTION, Tube re-Glass octal type used as a combined triode



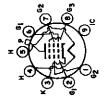
duites octal socket. Heater volts (ac/do), 6.3;

amperes, 0.3. Typical operation— Heptode unit:
plate volts, 250 (300 mar.); grids-No.2-and-No.4
volts, 100 mar.; grids-No.1-and-No.4
volts, 100 mar.; grids-No.1-and-No.4
sistance, 1.5 megohms: conversion transconductance, 290 mmhos: plate ma., 1.4; grids-No.2-and-No.4 ma., 2.8. Triode unit: plate volts, 250 mar
DISCONTINUED type listed for reference only.

BEAM POWER TUBE

Related types: 12JB6, 17JB6

Novar type used as high-efficiency horizontal-deflection-amplifier tube in television receivers. Outline 18A, OUT-LINES SECTION. Tube requires novar nine-contact socket and may be mounted in any position.



volts amperes	222
1.03 1.03	0.2 15 6
HEATER VOLTAGE (AC/DC). HEATER CURRENT.	DIRECT INTERELECTRODE CAPACITANCES (Approx.): Grid No.1 to Plate, Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3. Plate to Cathode, Heater, Grid No.2, and Grid No.3.

CLASS A, AMPLIFIER

Triode Pentode	Connection Connection	. 150 60 150 volts						1	- 390° 70 ma	- 320 2.1	42 volts
	Characteristics:	Plate Voltage	Grid No.3 (Suppressor Grid)	Grid-No.2 (Screen-Grid) Voltage	Grid-No.1 (Control-Grid) Voltage	Mu-Factor, Grid No.2 to Grid No.1.	Plate Registance (Approx.)	Transconductance	Plate Current	Grid-No.2 Current.	Grid-No.1 Voltage for plate current of 1 ma

For operation in a 525-line, 30-frame system HORIZONTAL-DEFLECTION AMPLIFIER

Maximum Ratings, (Design-Maximum Values): DC Plate Supely Voltage...........

volts

Max

770

											92CM-11835T
				٤	S34 }	YW6E	אורד: ¥	2 (IC2	™-08	45	
		+							 		300
AVERAGE CHARACTERISTICS		1				임				1	250
RACTE	o o	${\it H}$		5				-	-	<u> -</u>	
GE CHA	AT SOCKET.	H						-	-	j	200
AVERA	AT SOCI								£0.10		22
	ATHODE	+			-		-				
	0.00	+			-					1	\$
	MECTS CONNECT VOLTS#1	7				ر ال	+-	-+-	1		Š.
	TYPE 6.UBG Eres YOUTS 450-6910 No3 CONNECTED TO CATHODE AT SOCKET.		-				7	7	1	\mathbb{H}	
İ	\$ 1	9	 S	I) 53	RIBAMA B	! 	sta_jq } }	<u> </u>	8 9	~	•

Peak Positive-Pulse Plate Voltage#	6500 max	x volts
PEAK NEGATIVE-PULSE PLATE VOLTAGE	-1500 max	x volts
DC GRID-No.3 Voltaget	70 max	x volts
DC GRID-No.2 Voltage.	220 max	x volts
DC GRID-No.1 Voltage.	-55 max	x volts
PEAK NEGATIVE-PULSE GRID-No.1 Voltage	-330 max	x volts
PEAK CATHODE CURRENT	550 max	r ma
AVERAGE CATHODE CURRENT	175 max	x ma
PLATE DISSIPATION.	17.5 max	x watts
GRID-No.2 INPUT.	3.5 max	z watts
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode	200 max	
Heater positive with respect to cathode	200 max	¥
BULE TEMPERATURE (At hottest point)	240 max	ر د

= Technical Data

Maximum Circuit Yalves:

This value can be measured by a method involving a recurrent waveform such that the maximum For grid-resistor-bias operation.... Grid-No.1-Circuit Resistance:

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a ratings of the tube will not be exceeded

525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

† For horizontal-deflection service, a positive voltage may be applied to grid No.3 to minimize "miveters" interference in both wif and uhf television receivers. A typical value for this purpose is 30 volts.

An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

The de component must not exceed 100 volts.

SHARP-CUTOFF PENTODE

used in if-amplifier stages of television receivers utilizing intermediate fre-Tube features high transconductance Miniature type with frame grid quences in the order of 40 megacycles.

Related types: 3JC6, 4JC6

at low B-supply voltages. Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. છે. જ

volts ampere	pt
	0.019 max 8.2 3
ERATER VOLTAGE (AC/DC) ERATER CURRENT.	DIRECT INTERELECTRODE CAPACITANCES: Grid No.1 to Plate. Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield Flate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield

PLATE VOLTAGE 380 max volts	CLASS A, AMPLITER Moximum Rotings. (Design-Maximum Values):		
value 330 maz 380 maz See curve pa 0 maz 0 maz volts 0.6 maz 200 maz	ATE VOLTAGE.	380 max	volts
Superity Voltage See curve paragraph S	ID-No.3 (SUPPRESSOR-GRID) VOLTAGE, Positive value	0 max	volts
VOLTACE, Positive-bias value See curve paragraph VOLTACE, Positive-bias value O maz	ID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	330 max	voits
Vol.tadE, Positive-bias value 0 maz 1 vol.tadE, Positive-bias value 0 maz 0 6 maz 2 5 maz 2	ID-No.2 Voltage	See curve	page 70
s up to 165 volts between 165 and 330 volts See curve pa 2.5 max 2.5 max 2.6 max 200 ma	GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	0 max	volts
s up to 165 voits 1 between 165 and 330 voits 2 5 max 2 5 max 2 15 max 2 10 max eapect to cathode 2 6 max 2 125 125 125 5 6 13 met 13 met 13 met 13 met 13 met 14 for plate current of 100 max 13 met 15 max	ID-No.2 Input:	ç	
See curve pa See curve pa See curve pa See curve pa See curve pa See curve pa See curve pa See curve pa See curve pa See curve pa See curve pa See S	For grid-No.2 voltages up to 165 volts	0. b max	Watt
2.5 max Outdas: capect to cathode 200 max 2125 225 230 max 230 max 240 max 250 max	For grid-No.2 voltages between 165 and 330 volts	See curv	bage 70
OUTAGE: 200 max 200		2.5 max	watts
respect to cathode 200 maz capect to cathode 200*maz capect to cathode 125 125 125 125 125 125 125 125 125 125		;	•
espect to cathode 200*maz 125 125 125 6 6 0.18 me 15000 m 131 13 13 13 12 13 13 13 13 13 13 13 13 13 13 13 13 13	Heater negative with respect to cathode	200 max	voits
125 125 125 125 125 126 127 127 128 128 129 139 131 133 133 133 139	Heater positive with respect to cathode	200°max	volts
125 125 125 125 125 56 0.18 me 15000 μ 131 13 13 13 -32	procheristics		
Connected to cathode at a 125 125 125 125 125 125 125 125 125 125	te Sunniv Voltage	125	volts
125 56 0.18 me 15000 p. 1, for plate current of 100 μa.	A No 8	d to cathode	at socket
66 56 18 me 15000 μ 13 3.2 3.2 3.2 -3	d-No 2 Spania Voltage	125	volts
0.18 meg 15000 µ 13 µ 13 .2 (or plate current of 190 µ 233	thodo-Biss Register	25	ohma
15000 µm 13 13 1.) for plate current of 100 µm	te Resistance (Annox)	0.18	megohm
13 3.2 3.2, for plate current of 190 μa3		15000	Sod mu
3.2 s.) for plate current of 100 µa3	the Carrent	13	m8
.,) for plate current of 100 ms		27.50	S.C.
	d-No.1 Voltage (Approx.) for plate current of 100 µs	ę	volts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation.

The dc component must not exceed 100 volts.

92CM-11948T ī 0-12 위 GRID-No. I VOLTS ECI-O AVERAGE CHARACTERISTICS PLATE VOLTS TO CATHODE AT SOCKET. 8 Ib ις. ဇ္ဇ TYPE GUCG E, *G.3 VOLTS GRID No.3 CONNECTED T GRID—No.2 VOLTS = 125

Miniature type used as combined vhf oscillator and mixer tube in tele-SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-

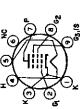
vision receivers employing series-connected heaterstrings. Outline 8B, OUT-

miniature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.45; warm-up time (average), 11 seconds. LINES SECTION. Tube requires

CLASS A, AMPLIFIER

עייין דייין				
	Triode	Pentode		
Maximum Ratings, (Design-Maximum Values):	Unit	Unit		
PLATE VOLTAGE	275 max	275 max	volts	
GRID-NO.2 (SCREEN-CRID) SUPPLY VOLTAGE	1	275 max	volts	
GRID-No.2 VOLTAGE	•	See curv	See curve page 70	
GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	o max	o max	volts	
Curly 2 Instru	I. ? max	2.8 max	Wates	
For grid-No.2 voltages up to 137.5 volts.	ı	0.45 max	watt	
For grid-No.2 voltages between 137.5 and 275 volts.		See curv	See curve page 70	
PEAK HEATER-CATHODE VOLTAGE:			1	
Heater negative with respect to cathode	200 max	200 max		
Heater positive with respect to cathode	200° max	200° max	volts	
Plate Voltage	125	100	125 volts	
Grid-No.2 Voltage	1			
Grid-No.1 Voltage.	7			
Amplification Factor	40	ı	1	
Plate Resistance (Approx.)	9009	3000	000 ohms	
Transconductance.	6500	5700 55	500 umbos	
Plate Current.	2	i	9 ma	
Grid-No.z Current	1 1	,	Z.2 ma	
Grid-No.1 Voltage (Approx.) for plate current of 20 µa		i	6.5 volts	
Maximum Circuit Values:				

= Technical Data ===



megohm megohm

0.25 max 1 max

SHARP-CUTOFF PENTODE

SECTION. Tube requires miniature Miniature type used as if-amplifier tube in television receivers utilizing an 40 megacycles.Outline8B, OUTLINES intermediate frequency in the order of

nine-contact socket and may be mounted in any position.

90[9 Related types: 3JD6, 4JD6 volts ampere

9.0 0.019 80 61 60

ď Z Z

max

HEATER VOLTAGE (AC/DC)
HEATER CURRENT
DIEST INTEREDECTRODE CAPACITANCES:
Grid No.1 to Plate
Grid No.1 to Robbide, Heater, Grid No.2, Grid No.3,
and Internal Shield
Plate to Cathode, Heater, Grid No.2, Grid No.3,

CLASS A1 AMPLIFIER

330 max volts
0 max volts
330 max volts
See curve page 70
0 max volts

330

0.6 max watts	See curve page 70	2.5 max watts		200 max volts	200 max volts
GRID-IN 0.2 INPUT: For grid-No.2 voltages up to 165 volts	For grid-No.2 voltages between 165 and 330 volts	PLATE DISSIPATION	Peak Heater-Cathode Voltage:	Heater negative with respect to cathode	Heater positive with respect to cathode

Characteristics:

	125	0	125	o;	99	160000	14000	15	4	6.5
		٠							٠	
	:	:	:	:	:	:	:	:	:	:
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,	7	ᇁ	끊	2	7	ä	2	¥	12	Ή.
	Plate Supply Voltage	H	Grid-No.2 Supply Voltage.	<u>.</u>	Α.	Plate Resistance (Approx.)	Transconductance	Plate Current.	Grid-No.2 Current	Grid-No.1 Voltage (Approx.) for transconductance of 600 µmhos
•	щ	9	v	٠.	اب	-	Ε,		_	~

volts volts volts ohms ohms

ma rna voits

Maximum Circuit Values:

Grid-No.1-Circuit Resistance: For fixed-bias operation. For cathode-bias operation.....

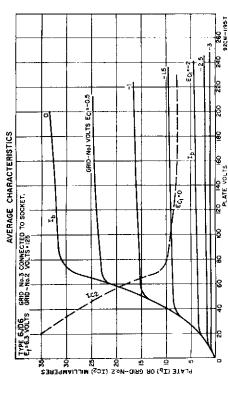
For navevous operation

For cathode-bias operation

The dc component must not exceed 100 volts.

megohm megohm

0.25 max 1 max

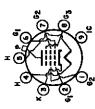


megohm megohm

0.1 max 0.5 max

i i

Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation.



DEAM POWER LUBE	• (e
Novar type used as horizontal-de-	
ction-amplifier tube in color tele-	73 70 0
ion receivers. Outline 18B, OUT-	注 1 2 2 2 2 2 2 2 2 2
NES SECTION. Tube requires no-	
r nine-contact socket and may be	
unted in any position.)] ₂ ,
	8.9
	2.5
ACITANCES (Approx.):	

	0.44 2.14 2.11
Novar type used as horizontal-deflection-amplifier tube in color television receivers. Outline 18B, OUT-LINES SECTION. Tube requires novar nine-contact socket and may be mounted in any position.	HEATER VOLTAGE (AC/DC). DIRECT INTERRILECTRODE CAPACITANCES (Approx.): Grid No.1 to Plate Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3. Plate to Cathode, Heater, Grid No.2, and Grid No.3.
6JE6	HEATER VOLTAGE (AC) ¹ HEATER CUBRENT DIRECT INTERELECTROR Grid No.1 to Fath Grid No.1 to Cath Plate to Cathode, I

22	:	Triode Pentode Connection Connection
le, Hester, Grid No.2, and Grid No.3.	CLASS A. AMPLIFIER	Triode Connection

Characteristics

Plate Voltage
Grid No.3 (Suppressor Grid)
Grid-No.2 (Screen-Grid) Voltage
Grid-No.1 (Control-Grid) Voltage
Amplification Factor
Plate Registance (Approx.)
Transconductance
Plate Current
Grid-No.2 Current
Grid-No.1 Voltage (Approx.) for plate current of 1 ma

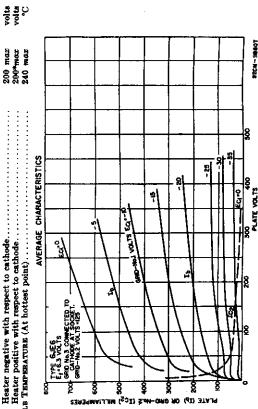
HORIZONTAL-DEFLECTION AMPLIFIER

FEAK FOSITIVE-FULSE FLATE VOLTAGE
PEAK NEGATIVE-PULSE PLATE VOLTAGE
DC Grid-No.3 Voltagre.
DC GRID-No.2 VOLTAGE
PEAK NEGATIVE-PULSE GRID-No.1 VOLTAGE
Peak Cathods Current
AVERAGE CATHODE CURRENT.
GRID-No.2 INPUT
PLATE DISSIPATION ^G .

volts volts volts volts

Heater negative with respect to cathode.

Heater positive with respect to cathode. BULB TEMPERATURE (At hottest point).... PEAK HEATER-CATHODE VOLTAGE:



Maximum Circuit Yalves:

= Technical Data

Grid-No.1-Circuit Resistance:

0.47 max megohm 10 max megohms For grid-resistor-bias operation^D.

For plate-pulsed operation (horizontal-deflection circuits only)

† This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

* The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

* In this service, a positive voltage may be applied to grid No.3 to minimize "snivets" interference; a typical value for this voltage is 30 volts.

An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

² An adequate bian resistor or other means is required to protect the tube in the absence of excitation. * The dc component must not exceed 100 volts.

volts

mperes

ጀጀጀ

										118811-M326
AVERAGE CHARACTERISTICS	TYPE 6JE6 E, 63 VOLTS GRID No.3 CONNECTED TO	CATHODE AT SOCKET. D-No.1 VOLTS *D			173	8		28	EC2=125	AND 400 500 PLATE VOLTS
AVERAGE	7 T T T T T T T T T T T T T T T T T T T	- 52/		<u>8</u>	2 VOLTS EC2*TS	GRIO - INC.	110			200 300
		EC2***	3			+		1	\$ - - - - - - - - -	8
	0	\$2 4 2	 	 β (2⊃χ)	2 ON-	3 90	8 8 (4t) 3	TAJ9 8 ; [3	۱ ۰



watts watts

Ē E

990 max 7000 max -1100 max 75 max 190 max -250 max 315 max 3.2 max 24 max

volts volts

SEMIREMOTE-CUTOFF PENTODE

Miniature type used in the gaincontrolled picture if-amplifier stages quires miniature seven-contact socket of television receivers. Outline 7B, OUTLINES SECTION. Tube

and may be mounted in any position. For curves of average plate characteristics, refer to type 6BZ6.

volts ampere		jd.	J d	Ē
6.3 0.3 Wilk	External Shield	0,015 max	7	က
Without	External Shield	0,025 max 0,015 max	!	co
HEATER VOLTAGE (AC/DC) HEATER CURRENT	DIRECT INTERELECTRODE CAPACITANCES:	Grid No.1 to Plate	No. 3, and Internal Shield Plate to Cathode, Heater, Grid No. 2, Grid	No. 3, and Internal Shield

CLASS A, AMPLIFIER

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	300 2002	ation
PLATE VOLTAGE	200	5
CRID-No. 3 (SUPPRESSOR-GRID) VOLTAGE, Positive value	0 max	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	300 max	volts
GRID-No.2 VOLTAGE	See	See curve page 70
GRID-NC.1 (CONTROL-CRID) VOLTAGE, Positive-bias value	0 max	volts
GRID-No.2 INPUT	;	٠
For grid-No. 2 voltages up to 150 volts	0.55 max	Watt
For grid-No.2 voltages between 150 and 300 volts.	See	See curve page 70

Prax Heater-Cathode Voltage: Heater negative with respect to cathode. Heater positive with respect to cathode.	200 max 200 max	volts
Characteristics: Poste Surnalis Valence	125	volt
Con Child No. 3	Connected to cathode at socket	de at socket
- 3	125	volts
Cothodo-Riou Registor	92	ohms
Plate Registance (Annous.)	0.26	megopm
Transconductance	8000	ampos
Transconductance Range for grid-No.1 voltage of -4.5 volts and cathode-bias resistor of 56 ohms.	400-900	soumu
Grid-No.1 Voltage (Approx.) for transconductance of 50 , mhos and no cathode-bias resistor	-19	volts
Plate Current	14	ma
Grid-No.2 Current.	3.6	TOR.
Maximum Circuit Values: Grid-No.1-Circuit Resistance:		,

BEAM-DEFLECTION TUBE

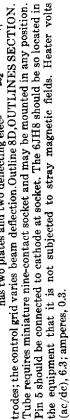
megohm megohm

0.25 max 1 max

For fixed-bias operation.

The dc component must not exceed 100 volts. "With external shield connected to cathode.

⊚∡ <u>@</u> modulator and burst-gate circuits in color television receivers. This type Miniature type used in color-dehas two plates and two deflecting elec-



COLOR TV DEMODULATOR

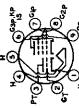
volts	volts volts volts ma	1 max watt 0.1 max megohm 0.25 max megohm
330 max	165 max 165 max 330 max 0 max 33 max	1 max 1 max 5 max
330	-166 max 165 max 390 max 0 max 33 max	0.1 0.25
Maximum Ratings, (Design Maximum Values): PLATE VOLTAGE (EACH PLATE). Drive Demonstrate Brand Plates (Bach Flates):	Negative value Positive value Positive value GRID-NO.3 (ACCELERATING-CRID) VOLTAGE, GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value CATHODE CURRENT PLATE DISSIPATION (EAGE PLATE).	GRtD-No.3 InPUT. Maximum Circuit Values: Grid-No.1 Circuit Resistance: For fixed-bias operation. For eathode-bias operation.

CLASS A₁ AMPLIFIER

With both plates connected together and with both

Characteristics:	
Plate-No.1 Supply Voltage	250
Plate-No.2 Supply Voltage	250
Grid-No.3 Voltage	250
	220
Transconductance	4400
Total Plate Current	14
Grid-No.3 Current.	7°
Grid-No.1 Voltage (Approx.) for total plate current of 10 us	-13

= Technical Data =



SHARP-CUTOFF PENTODE HIGH-MU TRIODE-

Miniature type with frame-grid pentode unit used in television retube, and the pentode unit is used as a ceivers. The triode unit is used as a voltage-amplifier or sync-separator

video-amplifier tube. Outline 11A, OUTLINES SECTION, except base is smallbutton miniature 9-pin. Tube requires miniature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.725.

CLASS A₁ AMPLIFIER

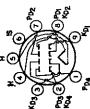
	Triode	Pentode	ode	
Maximum Ratings, (Design-Maximum Values):	Unit	Unit	72	
PLATE VOLTAGE.	330 max	330 max	nax	volts
	ı	330 max	naz	volts
GRID-No.2 Voltage	1	See curve		page 70
GRID-No.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	0 max	max 0	TOU	volts
PLATE DISSIPATION.	1 max	4,	4 max	watts
GRID-No.2 INPUT:				
For grid-No.2 voltages up to 165 volts.	ı	1.1 max	nar	watts
For grid-No.2 voltages between 165 and 330 volts	1	See	See curve page 70	age 70
PEAK HEATER-CATHODE VOLTAGE:				
Heater negative with respect to cathode.	200 max	200 max	nar	volts
Heater positive with respect to cathode	200max	200 max	nax	volts
Chorocteristics				
Plate Sunniv Voltage	250	35	200	volts
Grid-No.2 Supply Voltage	ı	100	100	volts
	6		. 1	4
Crid-No.1 Voltage	7	>	1 6	91.
Cathode-Bias Resistor	ŧ	I	82	opus
Amplification Factor	100	ı	1	
Plate Renstance (Approx.)	37000	ι	50000 ohms	ohms
Transconductance	2700	1	20000	ven hos
Plate Current	5.5	50	17 ma	ma
Grid-No 2 Current	ı		8	ma
	1	ı	ic.	volta
Grid-No. 1 Voltage (Approx.) for plate current of 20 us.	. . .	,	ı	volts

Maximum Circuit Values:

ux 0.25 max megohm ux 1 max megohm	
Grid-No.1-Circuit Resistance: For fixed-bias operation. For eathode-bias operation. I max	

The de component must not exceed 100 volts.

This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.



QUADRUPLE DIODE

tector and noise-immune, color-killer also used in bridge-matrixing circuits Miniature type used in phase-decircuits of color television receivers; in FM stereo multiplex equipment.

Outline 8D, OUTLINES SECTION. Units I and 2 are shielded from units 3 and 4 to minimize coupling between the series-connected pairs of diodes. Tube requires miniature nine-contact socket and may be mounted in any position.

volts ampere	ăăă
6.8 0.6	1.8 2.2 0.62
HEATER VOLTAGE (AC/DC). HEATER CURRENT	DIRECT INTERELECTRODE CARACITANCES (APPROX.): Plate of Unit No.1 and Cathode of Unit No.2 to Cathode of Unit No.2. Plate of Unit No.1 and Cathode of Unit No.2 to Plate of Unit No.2. Plate of Unit No.2 to Heater and Internal Shield.

RCA Receiving Tube Manual

ăăăăă	volts ms	volts volts	an.
1.9 2.2 0.94 1.9	300 max 54 max 9 max	300 max 300 max	90
Plate of Unit No.3 and Cathode of Unit No.4 to Cathode of Unit No.3 Plate of Unit No.5 and Cathode of Unit No.4 to Plate of Unit No.4 to Pleater and Internal Shield Cathode of Unit No.4 to Heater and Internal Shield Cathode of Unit No.1 to Heater and Internal Shield Cathode of Unit No.3 to Heater and Internal Shield	Maximum Ratings, (Design-Maximum Values, Each Unit): Prak Inverse Plate Voltage. Prak Plate Current DC Output Current	Peak Heafer-Cathode Voltage: Heafer negative with respect to cathode. Heafer positive with respect to cathode.	Characteristics, Instantaneous Value, (Each Unit): Plate Current for plate voltage of 10 volts.

SHARP-CUTOFF PENTODE HIGH-MU TRIODE-

Related type: BJV8

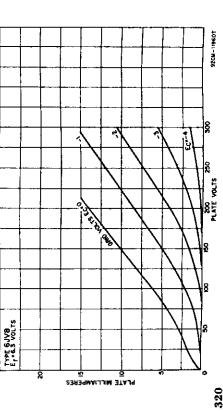
Miniature type used in a wide ceivers, particularly those having lowseries-connected heater strings. The voltage "B" supplies and employing variety of applications in television re-



noise-suppression circuits. The pentode unit is especially useful as a video amplifier tube. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact triode unit is used in sound-if, keyed-age, sync-separator, sync-amplifier, and socket and may be mounted in any position.

volts ampere seconds	222	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
6,8 11	0,00 PI 01	0.08 max 8 3.2 0.012 max 0.24 max
Heater Voltage (ac/dc). Heater Current Heater Warm-Up Time (average). Direct Interelectrode Capacitances (approx.):	From Cathode and Heater Grid to Cathode and Heater	Fentone Unit: Grid No.1 to Clathode, Heater, Grid No.2, Grid No.3, and Internal Shield Grid No.1 to Cathode, Heater, Grid No.2, Grid No.8, and Internal Shield Plate to Cathode, Heater, Grid No.2, Grid No.8, and Internal Shield. Pentode Grid No.1 to Triode Plate. Pentode Plate to Triode Plate.

AVERAGE PLATE CHARACTERISTICS TRICE UNIT



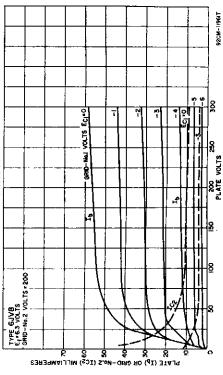
= Technical Data

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Moximum Ratings, (Design-Maximum Values):		Triode Unit	Pentode Unit	
PLATE VOLTAGE.		330 max	330 max	volts
GRID-NO.2 (SCREEN-GRID) VOLTAGE		1	330 max	volts
GRID-NO,1 (CONTROL-GRID) VOLTAGE:				
Positive-bias value		0 max	0 max	volts
Negative-bias value		-50 max	-50 max	volts
PLATE DISSIPATION		1.1 max	4 max	watts
GRID-No.2 Input		ı	1.7 max	watts
PEAR HEATER-CATHODE VOLTAGE:				
fleater negative with respect to cathode		200 max	200 max	
neater positive with respect to cathode,		Z00=max	700-max	volts
Characteristics	Triode Unit	Pentode Unit	nii	
Plate Voltage	200	60 125	200	volts
Grid-No.2 Voltage	ı	200 125	200	volts
Grid-No.1 Voltage	6 7		6.2	volts
Amplification Factor.	70	1	,	
Plate Resistance (Approx.)	0.0175	- 0.1	0.15	megohm
Transconductance	4000	- 11500 10700	10700	solmy
Plate Current.	4	51 22	22	TOR
Grid-No.2 Current.	ı	14. 4	4	ma
Grid-No.1 Voltage (Approx.) for plate				
current of 20 µa	ا ت	1 - 5.0	6-	volts
Maximum Circuit Values:				
Grid-No.1-Current Resistance:				
For fixed-bias operation.		0.5 mcx	0.25 max megohm	megohm
For cathode-bias operation.		1 max	1 max	1 max merohm

*The dc component must not exceed 100 volts. This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

AVERAGE CHARACTERISTICS PENTODE UNIT



HIGH-MU TRIODE

as class A₁ amplifier: plate volts, 260 max; grid volts, -3; amplification factor. 70; plate resistance, 50000 chms; transconductance, 1400 umbos; plate ma., 1.1. This is a DISCONTIN. UED type listed for reference only. Glass octal type used as voltage amplifier in radio equipment. Outline 15A, OUTLINES SECTION. Tube requires octal socket. Heater volts (ac/dc), 6.3; amperes, 0.3. Characteristics

6K5GT

•		63 n push-pull. l socket and N. It is espe- adequately	volts ampere pf pf
Sa C	\$ 6 C	NG (ly or i es octa CTIO) oes, be	80 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
POWER PENTODE	Glass octal type used in output stage of radio receivers and, triode- connected, as a vertical deflection am- plifier in television receivers. It is capa-	ble of delivering moderate power out- ble of delivering moderate power out- This type may be supplied with pin No.1 omitted. Tube requires octal socket and may be mounted in any position. Outline 14C, OUTLINES SECTION. It is especially important that this tube, like other power-handling tubes, be adequately ventilated.	Heater Voltage (ac/dc) Heater Current Direct Interescretore Caacitances (Approx.): Grid No.1 to Plate Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3 Plate to Cathode, Heater, Grid No.2, and Grid No.3
	6K6GT	put with relativel This type may be may be mounted cially important a	HEATER VOLTAGE (AC/DC) HEATER CURRENT DIRECT INTERFERENTENDE CAPACITANCES Grid No.1 to Plate Grid No.1 to Cathode, Heater, Grid N Plate to Cathode, Heater, Grid No.2,

	315 max	285 max	2.8 max	200 max	2001 max
Plate to Cathode, Heater, Grid No.2, and Grid No.3	Maximum Ratings, (Design-Center Values):	CRID-No.2 (SCREEN-GRID) VOLTAGE	PLATE DISSIPATION. GRID-NO.2 INPUT	Peak Heater-Cathods Voltags: Heater herative with respect to cathode	Heater positive with respect to cathode

volts volts watts watts

Pear Hearer-Cathods Voltags: Heater negative with respect to cathode. Heater positive with respect to cathode. * The dc component must not exceed 100 volts.			200 max 200* max	volts volts
Typical Operation:	100	950	12	volts
Plate Voltage.	100	320 320 320 320 320 320 320 320 320 320	250	volts
GIRC-No.2 Volcage	ì	118	-21	volts
Grid-No.1 (College) - Oreake		18	12	volts
Tour Circus Dista Current	· øi	55	25.5	E
winds Signal Plate Current	io oi	33	88	ma
Manifern Signal Caid-No 9 Current	1.6	5.5	4.0	ma
Management Child-No 9 Current	or.	10	ø.	ma
Almuni-Signal Gild-Ives Currents.	104000	00006	110000	ohma
Title Designation (Application)	1500	2300	2100	SOUTH T
L'adreconductance	12000	7600	0006	ohma
LOSG IVESISCRINGS	-	11	15	per cent
Meximum Signal Power Outbut	0.35	3.4	4.5	watts
		River	Cathode	

	Controcte	
Trained Pash, Pall Conserction (Values are for (we tubes): Bias	Bias	
	285	volts
	285	volts
Grid-No.z Supply votesge	1	volts
	400	ohms
Cathode-bias resistor	_01	volts
Fear Affection of the Control of the	22	ma
Zerovignasi riate Current.	19	ECI
	6	103
	<u>e</u>	E
Maximum-Signal Grid-No.2 Current	12000	ohtme
	2007	400 404
Total Harmonic Distortion	* *	Table Centre
	0	6776
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance:		4 4 4 4 4 4
For fixed-bias operation	0.1 max	megonin
For cathode-bias operation	0.0 780.5	megogam
Characteristics (Triode Connection)*:		
Plate Voltage	250	volts
Caid-No 1 Volterre	-18	volts
District Civilian	37.5	ma
Transconding to the control of the c	2700	muhos
Transconductance		ı

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PEAK NEGATIVE-PULSE GRID-NO.1 VOLTAGE. PEAK CATHODE CURRENT. AVERAGE CATHODE CURRENT. PLATE DISSIPATION. PEAK PERFECATIONE VOLTAGE.	-250 max 75 max 25 max 7 max	volts ma ma watts
Heater negative with respect to cathode. Heater positive with respect to cathode.	200 max 200mmax	volts volts
Maximum Circuit Volue: Grid-No.1-Gircuit Resistance: For cathode-blas operation.	2.2 max	2.2 max megohms
יייייייייייייייייייייייייייייייייייייי		

† The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle, In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

* Under no circumstances should this absolute value be exceeded.

* The dc component must not exceed 100 volts.

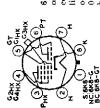
REMOTE-CUTOFF PENTODE

657

Outlines 3, 23, and 15A, respectively, OUT-LINES SECTION. These tubes require octal socket and may be mounted in any position. For electrode voltage supplies and application, refer to type 6SK7. Heater volts (ac/dc), 6.3; G and 6K7-GT used in rf and if stages of radio receivers, particularly in those employing avc. Metal type 6K7 and glass octal types 6K7-

6K7G1 Relative type **6K7G** 12K7GT

cathode at socket; grid-No.2 supply volts, 300 max; grid-No.2 volts, 125; grid-No.1 volts, -3; plate resistance, 0.6 of megobrair transconductance, 1630 mnhos; plate ma., 105; grid-No.2 ma., 2.6; plate dissipation, 2.75 max watts; grid-No.2 input, 0.35 max watts, Types 6K7 and 6K7-GT are used principally for renewal purposes. Type 6K7-G is a DISCONTINUED type listed for reference only. amperes, 0.3. Typical operation as class A1 amplifier: plate volts 250 (300 max); grid No.3 connected to

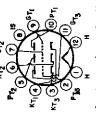


TRIODE-HEXODE CONVERTER

oscillator and hexode mixer tubes in radio receivers. Type 6K8, Outline 4; type 6K8-G, Outline 23, OUTLINES SECTION. Tubes require Metal type 6K8 and glass octal types octal socket. Heater volts (ac/dc), 6.3; amperes. 0.3. Typical operation in converter service: 6K8-G and 6K8-GT used as combined triode hexode plate volts, 250 (300 max); hexode grids-

6K8G 6K8GT Related type: 12K8 **6K8**

No.2-and-No.4 volts, 100 (150 max); hexode grid-No.3 volts, -3 (0 max); triode plate volts, 100 (125 max); triode grid resistor, 50000 ohms; hexode grid are resistance (approx.), 0.6 megohm; conversion transconductance, 350 µmhos; hexode plate ma., 3.8; triode grid and hexode grid-No. 1 ma., 0.15; total cathode ma., 1.25, (16 max). Types 6K8-G and 6K8-GT are DISCONTINUED types listed for reference only, Type 6K8 is used principally for renewal purposes.



THREE-UNIT TRIODE

Duodecar type containing one medium-mu and two high-mu triode units used as combined age, sync, and noise-inverter tube in television re-

heater strings. Outline 12A, OUTLINES SECTION. Tube requires duodecar 12-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.6; warm-up time (average), 11 seconds.

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Maximum Values):	Unit No. 1	Units Nos. 2 and 3	
PLATE VOLTAGE. GRID VOLTAGE	330 max	330 mar	volts
Negative-bias value.	-50 max	50 max	volts
FUSITIVE-DIAS VAIUE. CATHODE CURRENT	O max	0 max	volts ma
PLATE DISSIPATION.	2.75 max	0.3 max	watts

volts volts

315 max 1200°max

VERTICAL DEFLECTION AMPLIFIER (Triode Connection)*
For operation in a 525-line, \$0-frame system

Amplification Factor Plate Resistance (Approx.). Grid-No.1 Voltage (Approx.) for plate current of 0.5 ma. Pransconductance......

* Grid-No.2 connected to plate.

Maximum Ratings:

DC Plate Voltage.

Peak Positive-Puise Plate Voltage† (Adsolute maximum)......

ohms volts

= Technical Data =

KCA Keceiving Lube Manual	agn I	Manual		
ATER-CATHODE VOLTAGE:		000	200 max	>

volts volts	volts volts	ohms µmhos ma volts	
200 mar 200°mar	250 120 120	100 62500 1600 1.2	
200 max 200° max	8 25 5 5 6	77 2200 10.5 -24	
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode.	Characteristics: Plate Voltage. Grid Voltage	Amplification Factor Plate Reisstance (Approx.) Transconductance Plate Current. Grid Voltare (Androx.) for plate current of 10 \(\triangle a\)	o The de component must not exceed 100 volts.

SHARP-CUTOFF PENTODE HIGH-MU TRIODE-

6KA8 Related type: 8KA8

Miniature type used in color and black-and-white television receivers employing series-connected heater strings. The triode unit is used in syncseparator circuits; the pentode unit

has two independent control grids and is used in gated-agc-amplifier and noise-inverter circuits. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. For curves of average plate characteristics for triode unit, refer to type 6AW8-A. volts

volts ampere seconds	ಶಕ್ಷಣ	ăăăăă	volts	volts volts
6.3 0.6 11	01 00 01 01 00 01	0.1 max 9.5 0.5 2.2	Triode Unit 300 max	0 max -50 max
HEATER VOLTAGE (A/C) HEATER CURRENT HEATER WARE-UP TIME (AVERAGE) DIRECT INTERLECTE OF CAPACITANCES:	Triode Unit: Grid to Plate. Grid to Cathode, Heater, and Internal Shield Plate to Cathode, Heater, and Internal Shield.	Pentode Unit: Grid-No.1 to Plate. Grid-No.1 to Cathode, Reater, Grid No.2, Grid No.3, and Internal Shield Grid No.1 to Grid No.3 Grid No.1 to Grid No.3 Grid No.3 to Plate Grid No.3 to All Other Electrodes, Heater, and Internal Shield	CLASS A, AMPLIFIER Maximum Ratings, (Design-Mazimum Values): Plate Voltage.	GRID VOLTAGE Positive-bias value. Negative-bias value.

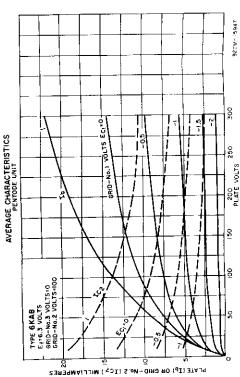


PLATE DISSIPATION	:	1.1 max	watts
FEAK REATER-CATHODS VOLTAGE: Heater negative with respect to cathode		200 max	volts
Heater positive with respect to cathode		200° max	volts
•	Triode	Pentode 77-24	
Characteristics:	211	27.0	
Plate Supply Voltage	200	150	volts
Grid-No.3 Supply Voltage	í	0	volts
Grid-No.2 Supply Voltage,	ı	100	volts
Grid-No.1 Supply Voltage	6 2	•	volts
Cathode-Bias Resistor.	ı	180	ohma
Amplification Factor.	50	1	
Plate Resistance (Approx.)	17500	100000	ohms
	4000	4400	ampos
Transconductance, Grid No.3 to Plate	ł	009	mrhos.
Plate Current	₹	4	TH.B
Grid-No.2 Current	ı	80.	m#
Grid-No., Supply Voltage (Approx.):			
For plate current of 10 us.	-5	1	volts
For plate entront of 90 as	1	7	volta
Colline Callein of the many of the whole carried of 90 as	ı	· E-	volta
Cridential and the contract of		•	
Maximum Circuit Values:			
Grid-Circuit Resistance:		Triode Unit	
For fixed-bias operation		0.25 max megohm	negohm
For cathode-bias operation		1 max 1	megohm
GATED AGC AMPLIFIER AND NOISE INVERTER	NVERTER		
Maximum Datings (Design Maring Values).		Pentode Unit	
MCAIROIN ACHINGS, (Designation of the contract		2000	410
DC PLATE VOLTAGE.		2011 000	STICA.
PEAK POSITIVE-PULSE FLATE VOLTAGE		2000	875
GRID-NO.3 (CONTROL-GRID) VOLTAGE:			-41
Positive-bias value,		2021 0	NO118
Negative-bias value.		-100 max	VOIIS
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE		300 max	Volts
GRID-No.2 Voltage		See curve	or eded
GRID-NO.1 (CONTROL-GRID) VOLTAGE:		•	:
Positive-bias value,		o max	voits
Negative-bias value,	: : : : : : : : : : : : : : : : : : : :		volta
PLATE DISSIPATION		2 max	watts
GRID-No.2 INPUT:		,	:
For grid-No.2 voltages up to 150 volts.	:	1.1 max	Watts
For grid-No.2 voltages between 150 and 300 volts.		See curve page 70	page 70
PEAK HEATER-CATHODE VOLTAGE:		200 max	volts
Heater negative with respect to cathode		200 max	volts
TERRET POSITIVE WINE TERPETE TO CONTRACT.			

92CM-11606T AVERAGE CHARACTERISTICS PENTODE UNIT 200 PLATE VOLTS TYPE 6KAB GRID-No.2 VOLTS-100 GRID-No.1 VOLTS-0 SITS MILLIAM (SOI) S.

= RCA Receiving Tube Manual =

= Technical Data ==

	0.68 max megonin	4	o s max megonin	I max megonin
Maximum Circuit Values:	Grid-No.3-Circuit Resistance.	Grid-No.1-Circuit Resistance:	For fixed-bias operation.	For cathode-bias operation.
Maximum (Grid-No.3-(Grid-No.1-C	For fixe	For cat

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

The de component must not exceed 100 volts.

MEDIUM-MU TRIODE SHARP-CUTOFF PENTODE

SKD8

Miniature type used as combined whf oscillator and mixer tube in television receivers. Outline 8B, OUT- UINES SECTION. Tube requires mine-contact socket and

LINES SECTION: Tube requires thiniature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.4.

CLASS A, AMPLIFIER

CLASS A, AMILITIEN				
•	Triode	Pentode		
Maximum Potinge. (Design-Maximum Values);	l'nit	Unit		
	330 max	330 max	volts	
FLATE VOLTAGE	1	330 max	volts	
CARLIFIACIO (SARABIA-MALE) DOLLER COMPANIO (SARABIA-MALE)	ı	See curve page 70	page 70	
tive-	0 max	nar 0	voits	
PLATE DISSIPATION.	2.5 max	2 max	Watts	
Calb-No.2 Input:		0 55 A	t to a	
For grid-No.2 voltages up to 165 volts.	ı	U. De right.	02.000	
For grid-No.2 voltages between 165 and 330 volts	1	see curve page 10	halke to	
Peak Heater-Cathode Voltage:		900	andra	
Heater negative with respect to cathode	200 002	7020 007	a for	
Heater positive with respect to cathode	Z00-max	200 - max	ACHES	
Characteristics				
	125	125	volts	
Flate voltage	;	110	volts	
Grid-No.2 voltage	-	7	volt	
Grid-No.1 Voltage	40,	. 1		
Amplification Factor	2 1	0.2	megonm	
Plate Resistance (Approx.)	7500	2000	soum,	
Transconductance	13.5	9.0	ma	
Flate Current	1	3.5	roa	
Grid-No.2 Current	6-	æ	volts	
CILICANOIT A OTTARE (Approach to the process of the city of the ci				
11 State Charles Values				

• The dc component must not exceed 100 volts. MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

megohm megohm

0.5 max 1 max

0.5 max 1 max

Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation

6KE8
Related type:
5KE8

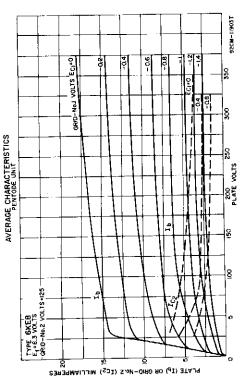
Miniature type with frame-grid pentode unit used as combined oscillator-mixer tube in television receivers using an intermediate frequency in the

OUTLINES SECTION. Tube requires miniature nine-contact socket and may be

	volts ampere	jd	Jď	Jd
	6.0 8.4	1.3	4.2	c1
mounted in any position.	Heater Voltage (ac/dc). Heater Current Direct Interelectrode Cafacitances:	Triode Unit:	Grid to Cathode, Heater, Fentode Cathode, Fentode Grid Grid No. 3, and Internal Shield	Plate to Cathode, Heater, Fencode Cathode, Fencode Grid No.3, and Internal Shield

ja ja ja	volts volts volts ma watts	max watt See curve page 70 max volts
0.015 max 5 3.4 5.5	Pentode Unit 280 max volts 280 max volts 0 max volts 20 max max 2 max watts	0.5 max See curv 200 max 200 max
	Triode Unit 280 max 0 max 20 max 2 max	200 max 200 max
PENTODE UNIT: Grid No. 1 to Plate. Grid No. 1 to Cathode. Heater, Grid No. 2, Grid No. 3, and Internal Shield. Plate to Cathode. Heater, Grid No. 2, Grid No. 3, and Internal Shield. Heaterto Triode Cathode and Pentode Cathode.	CLASS A, AMPLIFIER Maximum Ratings, (Design-Maximum Values): PLATE VOLTAGE. GRID-NO. 2 (SCHEEN-GRID) SUPPLY VOLTAGE. GRID-NO. 1 (SONTROL-GRID) VOLTAGE, Positive-bias value CATHODE CURRENT.	GRID-No. 2 INPUT: For grid-No. 2 voltages up to 140 volts For grid-No. 2 voltages between 140 and 280 volts. For grid-No. 2 voltages between 140 and 280 volts. PAR HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. 200 mm Heater positive with respect to cathode.

PLATE CHARACTERISTICS THOSE OWIT TYPE GKEB E1*6.3 OOL 15 PLATE CHARACTERISTICS THOSE OWIT TO SO SECURISTICS THOSE OWIT



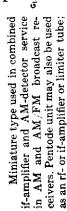
= Technical Data =

Characteristics:	Unit	Unit	14 June 1
Plate Supply Voltage.	125	125 125	volts
Grid-No.1 Supply Voltage	0	0	volts
Cathode-Bias Resistor.	89	33	ohms
Amplification Factor.	5000	195000	amy
Plate Resistance (Approx.).	8060	12000	urnhos.
ransconductance	61	=	THE
Plate Current	: I	61	EUL
Grid-No. 4 Cuttere (Approx.)	;		2
For plate current 100 ma	тф	1 '	volts
For plate current of 50 µa	l	က 	Siloa
Maximum Circuit Values:			
Grid-No. 1-Circuit Resistance:	0.5 max	0.25 max	megohm
For cathode-bias operation.	1 max	1 max 0.5 max	megohni
UWith external shield connected to cathode of unit under test, except as noted. With external shield connected to ground A with external shield connected to ground	er test, except as n	oted.	

DIODE

SHARP-CUTOFF PENTODE

6KL8 Miniat if-amplifier if-amplifier in AM an ceivers. Per



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the diode unit may be used for avc or detection. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. For curves of average plate characteristics for pentode unit, refer to type 6AU6A.

HEATER VOLTAGE (AC/DC) KEATER CURRENT	8 E	volts ampere	
DIRECT INTERELECTRODE CAPACITANCES: Pentode Unit:	600	ï	
Grid No.1 to Plate.	6 max	ž	
Plate to Cathode, Heater, Grid No.2, Grid No. 3, and Internal Shield	5	ዾ	
Pentode Grid No.1 to Diode Plate	OUTS MAKE	ī,	
Pentode Plate to Diode Plate.	60.0	<u>z</u> ,	

PENTODE UNIT AS CLASS A: AMPLIFIER

Marian Desiron (Desiron Marian Values):		
MUNIMUM KUMBS, (Designational Community)	300 max	volts
GRID-NO.3 (SUPPRESSOR-GRID) VOLTAGE:	-300 max volts	volts
Positive value	300 max	voits
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE	300 max	voits
GRID-NO.2 VOLTAGE.	See curve	page 70
GRID-NO.1 (CONTROL-GRID) VOLTAGE: Desitivation value	0 max	voits
Norative his value	-50 max	Voite
GRID-No.3 INPUT	0.2 max	Watt
GRID-No.2 INPUT: Rev end-No.2 voltages up to 150 volts.	0.6 max	watt
For grid-No.2 voltages between 150 and 300 volts.	See curve page 70	page 70
PLATE DISSIPATION	o maz	Watts
Peak Heater-Cathode Voltage: Heater negative with respect to cathode	200 max	volts
Heater positive with respect to cathode	200-max 150 mar	volts

Grid-No.1 Supply Voltage	0	volts
Grid-No.1 Resistor (Bypassed)	2.2	megohms
Plate Resistance (Approx.).	0.55	megohm
Transconductance	4300	umhos
Plate Current.	5.5	ma
Grid-No.2 Current.	2 2	ma
Grid-No.1 Voltage (Approx.) for plate current of 10 µa	4.2	volts
DIODE UNIT		
Maximum Ratings, (Design-Maximum Values):		
PLATE CURRENT	1 max	1118
Peak Heater-Cathode Voltage: Heater negative with respect to cathode.	200 max	volts
Heater positive with respect to cathode	200 max	volts
Characteristics, Instantansous Value: Tube Voltage Drop for plate current of 2 ms	10	volta

THREE

THREE

Minia

Minia

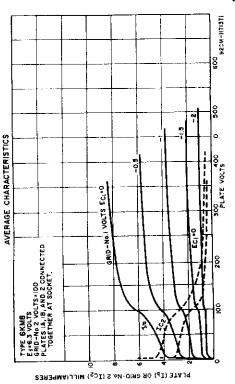
Perse circuits of

DIODE— THREE-PLATE TETRODE

Miniature type used in frequency-divider and complex-wave generator circuits of electronic musical instruments. In such circuits the tetrode

Plere Par unit can provide three independent output-signal voltages; the diode unit can be used as a key in a vibrato circuit. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position.

	volts ampere	•		ቯ	ă	ď	Ā	ቕ	þ	ă	ሽ	ă	jā	ď	
	89 ES			0.02 max	0.02 max	0.06 max	5	1.2	1.3	1.8	0.024 max	0.18	0.024	0.013	
ally like the mounted in any position.	HEATER VOLTAGE (AV/DC). HEATER CITREBUT	DIRECT INTERELECTRODE CAPACITANCES:	Tetrode Unit:	Grid No.1 to Plate No.1A	Grid No.1 to Plate No.1B	Grid No.1 to Plate No.2.	Grid No.1 to Cathode, Heater, Grid No.2, and Internal Shield	Plate No.1A to Cathode, Heater, Grid No.2, and Internal Shield	Plate No.1B to Cathode, Heater, Grid No.2, and Internal Shield	Plate No.2 to Cathode, Heater, Grid No.2, and Internal Shield	Tetrode Grid No.1 to Diode Plate	Tetrode Piste No.1A to Diode Plate	Tetrode Plate No.1B to Diode Plate	Tetrode Plate No.2 to Diode Plate	



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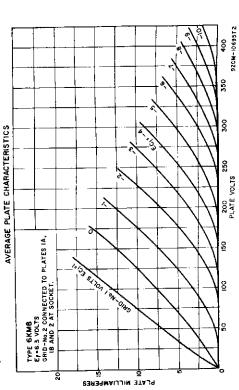
Characteristics:

100 volts
Connected to exthode at socket
Connected to exthode at socket
100 volts

TETRODE UNIT AS CLASS A, AMPLIFIER Plates No. 14, 18, and 2 connected logether

Characteristics:				
Dista Voltage			100	volts
:			100	volta
Voltage			0	volts
Carl No 1 Resistor (Renagged)			61	megohms
Office Designation (Approx.)			30000	ohms
Transconductance			3400	soyum
Plate Current			4.2	
Light No 9 Current			<u></u>	ma
(Approx.	83		7	volts
Trindo Connection _ Plates No 14 18 and 2 connected to arid No. 2	P. and 2 c	onnerted to arid	No. 2	
			91	volte
Flate voltage			•	volte
Grid-No.1 Supply Voltage			•	
Grid-No.1 Registor (Bypassed)				megoning
Transconductance			4500	soque
Amelification Factor			45	
Plate Current			5,5	E CL
Songrate water the section intites not under test prounded	for not unde	er test prounded		
Dieta	1.4	1.8	63	
Dista Valtage	100	100	100	volts
Card-No 2 Voltage	100	100	100	volts
Volt	0	0	0	volts
Child-No. 1 Registor (Ryphaged)	61	63	61 61	megohma
Transcondingtone	2000	2000	1800	Boutan,
Plate Resistance (Approx.)	0.1	0.1	0.12	megohm
Dieto Current	5	2.3	2.1	ma.
Grid-No.2 Current.	80	89.69	89. 89.	ma
TETRODE LINIT AS FREQUENCY DIVIDER AND COMPLEX-WAVE GENERATOR	OD ONY	MPLEX-WAVE	GENERATO	ř

			Volts	See curve page 70			volts		Wett	8	Wate			VOITE
2010		230 max	SSO mark	See curv	ć	nom o	-50 max	į	0.65 max	See curv	I max		200 max	Z00=max
TETRODE UNIT AS PREQUENCY DIVIDER AND COMPLEX. WAVE GENERALOR	Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE (Each plate)	GRID-NO.2 (SCREEN-GRID) SUFPLY VOLTAGE	GRID-NO.2 VOLTAGE.	GRID-NO.1 (CONTROL-GRID) VOLTAGE:	Positive-bias value	Negative-bias value.	GRID-NO.2 INPUT:	For grid-No.2 voltages up to 165 volts	For grid-No.2 voltages between 165 and 330 volts	PLATE DISSIPATION (Each plate)	PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode	Heater positive with respect to cathode



•	ata
Ĺ	7
	prical
Į	Iec
	1

2.2 mar megohms		1 max mg	10 volts	
Maximum Circuit Values: Grid-No.1-Circuit Resistance: For grid-No.1-resistor-bias operation.	DIODE UNIT	Maximum Ratings, (Design-Maximum Values): PLATE CURRENT.	Characteristics, Instantaneous Values: Tube Voltage Drop for plate current of 2 ma. The de component must not exceed 100 volts.	į



SHARP-CUTOFF PENTODE HIGH-MU TRIODE—

plifier tube, and the triode unit as a The pentode unit is used as an if-am-Miniature type used in a variety of applications in television receivers.

kt Pp sync-separator or voltage-amplifier tube. Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.6.

CLASS A, AMPLIFIER				
	Triode	Pentode		
Maximum Ratings, (Design-Maximum Values):	Unit	Unit		
PLATE VOLTAGE.	330 max	330 max	volta	
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE	ı	330 max	volts	
GRID-NO.2 VOLTAGE.	1 9	See curv	See curve page 70	
GRID-NO.1 (CONTROL-GRID) VOLTAGE, FOSITIVE-DIAS VAIUE	1 1100.1	2 5 2007	watta	
GRID-NO.2 INPUT:				
For grid-No.2 voltages up to 165 voits.	ı	0.55 max	watt	
For grid-No.2 voltages between 165 and 330 volts	i	See curve	See curve page 70	
PEAK HEATER-CATHODE VOLTAGE:	000	006	a tore	
Heater negative with respect to cathode	200°max	200 max	volts	
Treater hospitae with respect to common the second to the			!	
Characteristics:				
Plate Voltage	250	125	volts	
Grid-No.2 Voltage	1	125	volts	
Grid-No.1 Voltage	-5	7	volts	
Amplification Factor	100	1		
Plate Resistance (Approx.)	31500	150000	smile.	
Transconductance,	3200	10000	utmhos	
Plate Current,	.00	27	ma	
Grid-No.2 Current	1	4.	SU.	
Grid-No.1 Voltage (Approx.) for plate current of 20 µs	-3.5	-1	volts	
Maximum Circuit Values:				
Grid-No.1-Circuit Resistance:				
For fixed-bias operation	0.5 max	0.5 max	megohm	
For cathode-bias operation	I max	TDW T	megopu	
 The dc component must not exceed 100 volts. 				

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SHARP-CUTOFF PENTODE HIGH-MU TRIODE

pentode unit used in black-and-white ©c2p television receivers. The triode unit is Miniature type with frame-grid used in general-purpose voltage-amplifier, sync-separator, and sound-if-



volts ampere OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. For curves of average plate characteristics for triode amplifier applications. The pentode unit is used as a video output tube. Outline $8\mathrm{D},$ 6.3 Heater Voltage (ac/dc).
Heater Current
Heater Current
Tide Unit:
Grid to Plate. unit, refer to type 6AW8-A.

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6.2 F.-

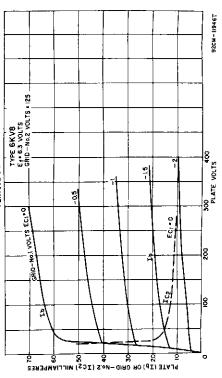
Caid to Cathode Heater Pentode Cathode Pentode Caid No 3		
and Internal Shield	29	ď
Plate to Cathode, Heater, Pentode Cathode, Pentode Grid No.3,		•
and Internal Shield	2.4	ď
Triode Grid to Pentode Plate	0.015 max	
Pentode Unit:		
Grid No.1 to Plate	0.09 max	ā
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	13	ď
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield.	8.4	d
Dantado Dieta to Triode Dieta	0 17 2007	Ē

CLASS A, AMPLIFIER

	Triode	Pentode		
Maximum Ratings, (Design-Maximum Values):	l'nit	Unit		
DIAME VOLTAGE	300 200	300 200		volts
Chara No 9 (acceptational) Street Vot that	. 1	200 4807		wolte
Child-More (Scheban-dally) Soft at Chinds		200		
GRID-No.2 Voltage.	I	See cu	See curve page 70	02 as
GRID-NO.1 (CONTROL-CRID) VOLTAGE, Positive-bias value	0 mar	0 max		volts
PLATE DISSIPATION.	1 max	5 max		watts
GRID-NO.2 INPUT:				
For grid-No.2 voltages up to 150 volts.	l	1 max		watt
For grid-No.2 voltages between 150 and 300 volts.	ı	See cu	/e Day	re 70
PEAR HEATER-CATHODE VOLTAGE:			•	
Heater negative with respect to cathode	200 max	200 max		volts
Heater positive with respect to cathode	200 -max	200 max		volts
Characteristics				
Dieto Samily Voltene	000	195	900	volte
Time and his accordance and in the second				3
Grid-No.2 Supply Voltage	l	125	125	volts
Grid-No.1 Supply Voltage	-75	0	0	volts
Cathode-Bias Registor.	ì	85	89	ohms
Amplification Factor	02	Į	1	
Dist. Donistones (Approx.)	17500	55000 750	75000	ohme
Target register and a second of the second o				1
Transconductance	4000			Sound
Flate Currenc	#		13	RIII
Grid-No.2 Current.	ı		T.	ma
Grid-No.1 Voltage (Approx.) for plate current of 100 µa	-4.5		æ.	volts
Maximum Circuit Values:				
Grid-No.1-Circuit Resistance:	:			,
For fixed-bias operation For eathode-bias operation.	0.5 max 1 max	0.1 max 0.25 max		megohm megohm

AVERAGE CHARACTERISTICS PENTODE UNIT

The dc component must not exceed 100 volts.



= Technical Data =

MEDIUM-MU TRIODE

Glass octal type used as detector, amplifier, or oscillator in radio receivers. Outline 22, OUT-LINES SECTION. Heater volts (ac/dc), 6.3; ma., 8; plate resistance, 9000 obms; amplifica-tion factor, 17; transconductance, 1900 pathos; grid voltage for cathode-current cutoff, -20. This is a DISCUNTINUED type listed for amperes, 0.15. Typical operation and characteristics: plate volts, 250 maz; grid volts, -9; plate reference only.

6L5G

BEAM POWER TUBE

919

ing equipment, especially units detypes 6L6-G, 6L6-GB, 6L6-GC are used in the output stage of audio amplifysigned to have ample reserve of power-Metal type 6L6 and glass octal

616GB 29919 9919

TION, Tubes require an octal socket and may be mounted in any position. It is quately ventilated. Type 6L6-G is a DISCONTINUED type listed for reference only. Type 6L6-GC can be used in place of types 6L6, 6L6-G, and 6L6-GB. Type especially important that these tubes, like other power-handling tubes, be adedelivering ability. These types provide high power output, sensitivity, and high efficiency. Power output at all levels has low third- and higher-order harmonics. Type 6L6, Outline 6; types 6L6-GB and 6L6-GC, Outline 19C; OUTLINES SEC-6L6-GC may be supplied with pin 1 omitted.

HEATER VOLTAGE (AG/DC)	:	6.3	volts
HEATER CURRENT.	:	6.0	ampere
DIRECT INTERELECTRODE CAPACITANCES (Approx.):	*9T!	6L6-GC	
Grid No.1 to Plate	4.0	9.0	jd
Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3.	10	10	ď
Plate to Cathode, Heater, Grid No.2, and Grid No.3	12	6.5	þ

* With pin 1 connected to pin 8.

Maximum Ratings:

	.L6, 6L6-G, 6L6-GB 6L6-GC	Design-Center Design-Maximum	Vatues Values
AMPLIFIER	T9		
CLASS A,			

PLATE VOLTAGE	360 max	500 max	volts
GRID-NO.2 (SCREEN-GRID) VOLTAGE	270 max	$450^{4}max$	volts
PLATE DISSIPATION.	19 max	30 max	watts
GRID-No.2 Input.	2.5 max	5 max	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	180 max	200 mar	volts
Heater positive with respect to cathode	180 max	200 max	volts
Typical Operation:			
Plate Voltage	300	350	volts
Grid-No.2 Voltage	200	250	volts
Grid-No.1 (Control-Grid) Voltage14	-12.5	-18	volts
Peak AF Grid-No.1 Voltage	12.5	81	volts
Zero-Signal Plate Current72	3 5	54	ma
Maximum-Signal Plate Current 79	55	99	m&
Zero-Signal Grid-No.2 Current	20.22	2.5	ma
Maximum-Signal Grid-No.2 Current 7.3	4.7	t-	ETI-
Plate Resistance (Approx.)	35000	33000	ohma
Transconductance	5300	5200	#mhos
Load Resistance	4500	4200	ohme
Total Harmonic Distortion 10	11	15	per cent
Maximum-Signal Power Output6.5	6.5	10.8	watts

CLASS A, AMPUFIER (Triode Connection)

	9		volts	watts
25-979	Design-	Marchille Fatte	450 max	30 max
25-979 95-979 979-979	Design-	enter values	275 max	19 max
61.6,	C	٥		
				(TOTAL)
	Mariana Dations.	Seguina month	PLATE VOLTAGE	PLATE DISSIPATION (TOTAL)
	44		PLAT	Pl.A1

RCA Receiving Tube Manual

PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode.	180 max 180 max	200 max 200 max	volts volts
Typical Operation:		250	Riles
Grid-No.1 Voltage.		-20	volts
		20	volts
Zero-Signal Plate Current	:	9	ma
Maximum-Signal Plate Current	:	44	ma
Plate Resistance (Approx.).		1700	ohms
Amplification Factor.		œ	
Transconductance		4700	soume
Load Resistance.	:	5000	ohms
Total Harmonic Distortion.		ıo	per cent
Maximum-Signal Power Output		† .1	Watts
† Grid No.2 connected to plate.			

PUSH-PULL CLASS A, AMPLIFIER

Maximum Ratings: (Same as for class A, amplifier)

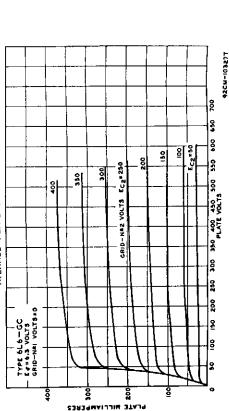
Typical Operation (Values are for two tubes):			
Plate Voltage	250	270	volts
Grid-No.2 Voltage.	250	270	volts
Grid-No.1 Voltage.	91-	-17.5	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage.	32	35	volts
Zero-Signal Plate Current.	120	134	ma
Maximum-Signal Plate Current.	140	155	ECI
Zero-Signal Grid-No.2 Current.	10	11	ma
Maximum-Signal Grid-No.2 Current.	16	17	ma
Effective Load Resistance (Plate-to-plate)	2000	2000	ohma
Total Harmonic Distortion	6/3	61	per cent
Maximum-Signal Power Output.	14.5	17.5	watts

PUSH-PULL CLASS AB, AMPLIFIER

Maximum Ratings: (Same as for class A, amplifler)

6L6-GC	450 voits	400 volts	-37 volts	70 volts	116 ma	210 ша	5.6 ma	22 ma	5600 ohms	1,8 per cent	55 watts
6L6, 6L6-GB, 6L6-GC	360	270	-22.5	45	88 88	140	rc	11	3800	C1	18
61.6, 6L6-C	980	270	-22.5	45	88	132	10	21	0099		26.5
Typical Operation (Values are for two tubes):	Plate Voltage	Grid-No.2 Voltage.	Grid-No.1 Voltage.	Peak AF Grid-No.1-to-Grid-No.1 Voltage.	Zero-Signal Plate Current,	Maximum-Signal Plate Current	Zero-Signal Grid-No.2 Current.	Maximum-Signal Grid-No.2 Current.	Effective Load Resistance (Plate-to-plate)	Total Harmonic Distortion	Maximum-Signal Power Output.

AVERAGE PLATE CHARACTERISTICS



= Technical Data =

PUSH-PULL CLASS AB, AMPLIFIER

amplifle
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class
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õ
(Same
Maximum Ratings:

1			
Typical Operation (Values are for two tubes):			
Plate Voltage	360	360	volts
Grid-No.2 Voltage	225	270	volts
Grid-No.1 Voltage	-18	-22.5	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	52	72	volts
Zero-Signal Plate Current,	78	88	ma
Maximum-Signal Plate Current.	142	205	EWB .
Zero-Signal Grid-No.2 Current,	3.5	2	ma
Maximum-Signal Grid-No.2 Current,	11	16	ma
Effective Load Resistance (Plate-to-plate)	0009	3800	ohma
Total Harmonic Distortion	61	73	per cent
Maximum-Signal Power Output.	31	47	watts

Maximum Circuit Values:

o.1-Circuit Resistance:	For fixed-bias operation.
	d-bias op
Grid-No.1-Circui	For fixe
5	

In push-pull circuits where grid No.2 of each tube is connected to a tap on the plate winding of the output transformer, this maximum rating is 500 volts. For cathode-bias operation.

PENTAGRID MIXER



applications where dual control is desirable in a single stage. The two separate control grids are shielded from each other and the coupling effects between oscillator and signal circuits are Metal type 6L7 and glass octal type 6L7-G ing a separate oscillator stage, as well as in other very small. For additional information, refer to used as mixers in superheterodyne circuits hav-

9219

volts applied to grid No.3, 18 min; plate dissipation, 1 max watt; grids-No.2-and-No.4 input, 1.5 max watts; plate am, 3.5; grids-No.2-and-No.4 ma., 9.2; plate resistance, greater than 1 megohm; conversion transconductance, 550 µmhos. Type 61.7-6 is a DISCONTINUED type listed for reference only. Type 61.7 is used principally for renewal purposes. NC:6L7-C 65 Frequency Conversion, ELECTRON TÜBE AP-PLICATIONS SECTION. Outlines 3 and 23, OUTLINES SECTION. Heater volts (ac /dc), 6.3; amperes, 0.3. Typical operation as mixer (values recommended for all-wave receivers): plate volts, 250 (300 max); grids-No.2-and-No.4 volts, 150 max; grid-No.1 volts, -6 min; grid-No.3 volts, -15; peak oscillator

Refer to type 6AB5/6N5

Glass octal type used as class A, power amplifer. Outline 26, OUTLINES SECTION. Heater volts (ac/dc), 6.3; amperes, 0.8. For electrical characteristics, refer to type 6B6. Type 6N6-G is a DISCONTINUED type listed for reference only. DIRECT-COUPLED POWER TRIODE

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MEDIUM-MU TWIN POWER TRIODE

used in output stage of radio receivers as class B power amplifier or with units in parallel as a class A₁ amplifier. Outlines 5 and 14C, respectively, OUTLINES SECTION. Tubes require octal socket. Heater volts (ac/dc), 6.3; am-Metaltype 6N7 and glass octal type 6N7-GT peres, 0.8. Typical operation as class A₁ amplifier: plate volts, 300 max; grid volts, -6; amplification factor, 35; plate resistance (approx.),

S:6N7 NC:6N7-GT

6N7

amplifier (both units): plate volts, 800 maz; plate-supply impedance, 1000 ohms; effective grid-circuit impedance, 516 ohms; grid volts, 0; peak af grid-to-grid volts, 82; plate ma., 36 (zero signal), 70 (maximum signal); peak grid ma. (each unit), 22; effective load resistance (plate to plate), 8000 ohms; maximum-signal power output, 10 watts. These types are used principally for renewal purposes. 11000 ohms; transconductance, 3200 μ mhos; plate ma., 7. Typical operation as push-pull class B power

fier, or oscillator in radio receivers. Outline 14C, OUTLINES SECTION. Tube requires octal socket. Heater volts (ac/dc), 6.3; amperes, 0.3. type is identical electrically with type 76, Type 6P5-GT is a DISCONTINUED type listed for Except for interelectrode capacitances, this Glass octal type used as detector, amplireference only.

REMOTE-CUTOFF PENTODE LOW-MU TRIODE-

(ac/uc), v.v. angress, this type is identical electrode capacitances, this type is identical electrically with type 6PT. Type 6PT-G is a Glass octal type used as an amplifier, Outline 23, OUTLINES SECTION. Heater volts DISCONTINUED type listed for reference 6.3; amperes, 0.3. Except for inter-(ac/de),

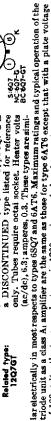
6P7G

TWIN DIODE—HIGH-MU TRIODE

P02

plifer, and ave tubes in radio receivers. Our-lines 3, 23, and 154, respectively, OUTLINES SECTION. Types 6Q7 and 6Q7-GT are used principally for renewal purposes. Type 607-G is a DISCONTINUED type listed for reference Metal type 6Q7 and glass octal types 6Q7-G and 6Q7-GT used as combined detector, am-

> **607G**1 **607G**



triode unit as a class A1 amplifier are the same as those for type 6AT6 except that with a plate voltage of 100 volts, the transconductance is 1200 unhos and the plate resistance 58000 ohms. For triodeunit, grid-bias considerations and diode curves, refer to type 6AV6.

~ F Kr₃ <u>چ</u> Duodecar type containing one medium-mu and two high-mu triode units used as combined sync-clipper and gated-agc-amplifier tube in tele-THREE-UNIT TRIODE

nected heater strings. Outline 12A, OUTLINES SECTION. Tube requires duodecar twelve-contact socket and may be mounted in any position. Heater volts (ac/dc), vision receivers employing series-con-

CLASS A: AMPLIFIER

6.3; amperes, 0.6; warm-up time (average), 11 seconds.

A second	Unit		
	No. 1	No. 1 Unit No. 2 or 3	
Flate Voltage	150	150 100 250	volts
Carlo Volume	•	-1 -2	volts
Amplification factor	130	100 100	
Flate Resistance (Approx.)	2000	30000 62500	ohme
Transconductance	2500	2500 1250 1600	MITTINGS
Plate Current	22	0.6 1.2	86
Grid Voltage (Approx.) for plate current of 10 µa	-13	¥.	volts
GATED AGC AMPLIFIER AND SYNC CLIPPER	CUPPER		
For operation in a 525-line, 30-frame system	system:		
		Unit No.	

GATED AGG AMPLIFIER AND SYNC CLIPPER	CUPPER		
ror open union in a ozo-tine, su-jrame system	System		
Maximum Ratings, (Design-Maximum Values):	Unit No. 1	Cant No.	
PLATE VOLTAGE.	330 mar	330 mar	
STEADY-STATE POSITIVE-PULSE GRID VOLTAGE	5 4002		S10.
PEAK POSITIVE-PULSE GRID VOLTAGE	60 mon	1	VOICE
DC GRID VOLTAGE:			volts
Positive-bias value	-	0	
Negative-bias value	100	TAO TREE	volts
PLATE DISSIPATION.	70011	204.007	volts
PEAK HEATER-CATHODE VOLTAGE:	2	10m 5.1	Watte
Heater negative with respect to cathode.	200	200 200	-
Heater positive with respect to cathode	000	200	Volts
***************************************	THE DAY	20 MGE	volts

Maximum Circuit Values:

Grid-Circuit Resistance.

= Technical Data

• The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds. • The dc component must not exceed 100 volts.

MEDIUM-MU TRIODE TWIN DIODE-



respectively, OUTLINES SECTION. Tubes require octal sockets. Within their maximum ratings, these types are identical electrically mum ratings of triode unit as class A: amplifier: amplifier, and ave tubes. Outlines 3, 23, and 15A, with type 6BF6 except for capacitances. Maxi-6R7-G and 6R7-GT used as combined detector Metal type 6R7 and glass octal

6R7G **SR7GT**

6R7

watts. For typical operation as a resistance-coupled amplifier, refer to Chart 7, RESISTANCE COUPLED AMPLIFIER SECTION, Types 6R7-G and 6R7-GT are DISCONTINUED types listed plate volts, 250 max; plate dissipation, 2.5 max

for reference only. Type 6R7 is used principally for renewal purposes.

MEDIUM-MU TRIODE

plifiers in television receivers. Type 6S4-A has a controlled heater warm-up Miniature types having high perveance used as vertical deflection amtime for use in television receivers em-

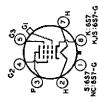
ploying series-connected heater strings. Outline 8D, OUTLINES SECTION. Tubes require miniature nine-contact socket and may be mounted in any position. Type 6S4 is a DISCONTINUED type listed for reference only.

Heater Voltage (ac/dc). Heater Current. Heater Warn-Up Time (Averge) for 6S4-A.	6.3 0.6 11	volts ampere seconds
Direct Interestreore Capacitances (Approx.): Grid to Plate. Grid to Cathode and Heater. Plate to Cathode and Heater.	2.4 0.6	ja ja
Characteristics: CLASS A, AMPLIFIER Plate Voltage Amplification Factor Plate Resistance (Approx.) Plate Resistance (Approx.) Plate Current. Plate Current for grid voltage of -15 volts Grid Voltage (Approx.)	250 -8 16.5 3700 4500 -24 -22	volts volts chms ranhos ma ma

For operation in a 525-line, 30-frame system VERTICAL DEFLECTION AMPLIFIER

REMOTE-CUTOFF PENTODE

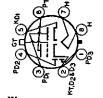
Metal type 6S7 and glass octal type 6S7-G used in rf and if stages of automobile receivers employing avc. Outlines 4 and 23, respectively, OUTLINES SECTION. Type 6S7 is used principally for renewal purposes. Type 6S7-G is a DISCONTINUED type listed for reference only. Tubes require octal socket. Heater volts, 6.3; amperes, 0.15, Typical operation as Class At amplifier: plate volts, 250 (300 max); grid-



> No.2 volts, see curve page 66; grid-No.2 supply volts, 300 maz; grid-No.1 volts, -3 (0 maz); grid No.3 connected to cathode at socket; plate ma., 8.5; grid-No.2 ma., 2; plate resistance (Approx.), 1.0 meg. ohm; transconductance, 1760 amhos; plate dissipation, 2.25 max watts; grid-No.2 input: for grid-No.2 voltages up to 150 volts, 0.25 max watt; for grid-No.2 voltages between 150 and 300 volts, see curve page 66. Peak heater-cathode volts, 90 max.

TRIPLE DIODE—HIGH-MU TRIODE

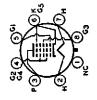
Glass octal type used as audio amplifier, AM detector, and FM detector in AM/FM receivers. Diode unit No.2 is used for AM detection, and diode units No.1 and No.3 are used for FM detection. Outline 15A, OUTLINES SECTION, except over-all length is 3-5/8 max Tube requires octal socket. Heater volts (ac/dc), 6.3; amperes, 0.3. Typical operation of triode inches and seated height is 3-1/16 max inches,



unit as class A. amplifier: plate volts, 250 (300 max); grid volts, -2; amplification factor, 100; plate resistance (Approx.), 91000 ohms; transconductance, 1100 µmhos; plate dissipation, 0.5 max watt; platma, 0.9; peak heater-cathode volts, 90 max. Maximum plate ma. for diode units, 1.0 max (each unit). Peak heater-cathode volts (diode unit No.1), 90 max. For diode operation curves, refer to type 6AV6. Type 6S8-GT is used principally for renewal purposes.

PENTAGRID CONVERTER

types, see Frequency Conversion in ELECTRON TUBE APPLICA-TIONS SECTION. Both tubes have Metal type 6SA7 and glass octal type 6SA7-GT used as converters in superheterodyne circuits. They are For general discussion of pentagrid excellent frequency stability. Tubes require octal socket and may be mounted in any position. Outlines 2 and 14C, re-Type 6SA7-GT is used principally for similar in performance to type 6BE6. spectively, OUTLINES SECTION Heater Voltage (ac/dg)..... renewal purposes.



トライマング	quire octal socket and may be mounted	30
OVA CI	in any position. Outlines 2 and 14C, re-	
Related types:	spectively, OUTLINES SECTION	で で で で で で で で で で に の に の に の に の に の
125A7, 125A7GT	Type 6SA7-GT is used principally for	
	renewal purposes.))) V
EATER VOLTAGE (AC/DC	EATER VOLTAGE (AC/DC).	
EATER CURRENT	EATER CURRENT.	810A 6'5
RECT INTERELECTRODE	IRECT INTERELECTRODE CAPACITANCES for 6SA 7:	o.o ampere
Grid No.3 to All Othe	Grid No.3 to All Other Electrodes (RF Input)	. T
Plate to All Other Ele	Plate to All Other Electrodes (Mixer Output)	
Grid No.1 to All Othe	Grid No.1 to All Other Electrodes (Osc. Input)	
Grid No.3 to Plate	Grid No.3 to Plate.	Jd **** Se O
Grid No.3 to Grid No.	Grid No.8 to Grid No.1	
Grid No.1 to Plate	Grid No.1 to Plate	
Grid No.1 to Shell, Gr	Grid No.1 to Shell, Grid No.5, and All Other Electrodes except Cathods	o. ou max.
Grid No.1 to Cathode	Grid No.1 to Cathode	
Cathode to Shell, Grid	Cathode to Shell, Grid No.5, and All Other Electrodes excent Grid No.1	
With shell connected to cathode.	cathode.	jď

volts ampere	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
6.8 8.0	9.5* 9.5* 7* 7* 0.25 max* 0.06 max* 4.4

9.5* 7* 0.25 max* 0.16 max* 4.4 2.6	

CONVERTER

Maximum Ratings, (Design-Center Values): * With shell connected to cathode. Grid No.1 to Cathode.

PLATE VOLTAGE.

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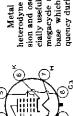
Grids-No.2-And-No.4 Supply Voltage Grid-No.3 (control-grid) Voltage:		volts
Negative bias value. Positive bias value.	•	volta
PLATE DISSIPATION	1.0 max 1.0 max	watt
CATHODE CURRENT		ma
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode.	90 max	volts volts
Separate Excitation	ont	
100	250	volts
	Connected to cathode at socket	at socke
Grids-No.2-and-No.4 Voltage,	100	volts
	67	volts
<u>ب</u>	20000	ohma
Plate Resistance (Approx.)	1.0	megohm
	450	soqu#
Grid-No.3 Voltage (Approx.) for transconductance of 10 µmhos -25	-25	volts
Grid-No.3 Voltage (Approx.) for conversion transconductance		
6- 00 mplos	<u>අ</u>	volts
		ET.
Grids-No.2-and-No.4 Current.	00 10	m
	0.0	ma ma
Cathode Current.	12.5	TH.8

ohms megohm µmhos

籄

† The characteristics shown with separate excitation correspond very closely to those obtained in a oscillating) is 4500 µmhos under the following conditions: grids No.1, No.3 at 0 volts; grids No.2 and NOTE: The transconductance between grid No.1 and grids No.2 and No.4 connected to plate (not No.4 and plate at 100 volts; for 6SA7 only, grid No.5 and shell are connected to cathode at socket. self-excited oscillator circuit operating with zero bias.

PENTAGRID CONVERTER



cially useful in FM converter service in the 100-megacycle region. The 6SB7-Y has a micanol Metal type used as converter in superheterodyne circuits. Because of its high conversion and oscillator transconductance, it is espebase which minimizes drift in oscillator frequency during warm-up period. For general dis-

cussion of pentagrid types, see Frequency Con-version in ELECTRON TUBE APPLICATIONS SECTION. Outline 2, OUTLINES SECTION. Tube requires octal socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.3. For maximum ratings and characteristics in converter service, refer to type 6BA7. Type 6SB7-Y is used principally for renewal purposes.

HIGH-MU TWIN TRIODE

age-amplifier circuits, Outline 2, OUTLINES SECTION, Tube requires octal socket. Heater Metal type used as phase inverter in radio equipment. Each unit may also be used in voltvolts (ac/dc), 6.3; amperes, 0.3. Characteristics as class A amplifier (each unit): plate volts, 250 max; grid voits, -2; amplification factor, 70; plate resistance (approx.); 53000 ohms; transconductance, 1325 µmhos; plate ma., 2; peak

Related type:

HIGH-MU TRIODE

heater-cathode volts, 90 max. This type is used principally for renewal purposes.

GT are used in resistance-coupled amplifier circuits. Outlines 2 and 14C, respectively, OUT-LINES SECTION. Type 6SF5-GT may be supences under type 6F5 apply to types 6SF5 and 6SF5-GT. Heater volts (ac/dc), 6.3; amperes, 0.3. These types are used principally for renewal Metal type 6SF5 and glass octal type 6SF5plied with pin No.1 omitted. Tubes require octal socket. Characteristics, application, and referpurposes

6SF5G1 Related types: 125F5, 125F5GT **6SF5**

REMOTE-CUTOFF PENTODE DIODE

12SF7

amperes, 0.3. Typical operation of pentode unit as class A₁ amplifier: plate volts, 250 (300 max); grid-No.2 volts, 100 (300 max); grid-No.1 volts, Metal type used as combined rf or if amplifier and detector or ave tube in radio receivers. Also used as resistance-coupled af amplifier. Outline 2, OUTLINES SECTION. Tube requires octal socket. Heater volts (ac/dc), 6.3; -1 (0 max); plate resistance (approx.), 0.7 meg-

ohm; transconductance, 2050 µmhos; plate ma., 12.4; grid-No.2 ma., 3.3; plate dissipation, 3.5 max watts; grid-No.2 input, 0.5 max watt; peak heater-cathode volts, 90 max. For diode operation curves, refer to type 6AV6. Type 6SF7 is used principally for renewal purposes.

SEMIREMOTE-CUTOFF PENTODE

Related type: 12567

TION. Tube requires octal socket. Heater volts (ac/dc), 6.3; amperes, 0.3. Characteristics as class A₁ amplifier: plate volts, 250 (300 max); grid-No.2 volts, 150 (300 max); grid-No.1 volts Metal type used as rf-amplifier tube in wide-band and high-frequency applications (up to 18 megacycles). Outline 2, OUTLINES SEC--2.5 (0 max); plate resistance, greater than 1

ma., 9.2; grid-No.2 ma., 3.4; plate dissipation, 3 max watts; grid-No.2 input, 0.6 max watt; peak heatermegohm; transconductance, 4000 µmhos; plate cathode volts, 90 max. This type is used principally for renewal purposes.

SHARP-CUTOFF PENTODE

Metal type used as rf-amplifier tube in high-frequency, wide-band applications, and as a limiter tube in FM equipment. Outline 2, OUTLINES SECTION. Tube requires octal Characteristics as class A₁ amplifier: plate volts, 250 (300 max); grid-No.2 volts, 150 (300 max); socket. Heater volts (ac/dc), 6.3; amperes, 0.3.

Related type:

125H7

μπλου; plate ma., 10.8; grid-No.2 ma., 4.1; plate dissipation, 3 max watts; grid-No.2 input, 0.7 max watt; peak heater-cathode volts, 90 max. This type is used principally for renewal purposes. grid-No.1 volts, -1 (0 max); plate resistance (approx.), 0.9 megohm; transconductance, 4900



Metal type 6SJ7 and glass octal

SHARP-CUTOFF PENTODE

S.65.77 (BC:65.17-GT type 6SJ7-GT used as rf amplifiers and biased detectors. As a detector, large audio-frequency output voltage either type is capable of delivering **68J7GT** Related types: 125J7 125J7GT

SECTION. Tubes require octal socket and may be mounted in any position. Type with relatively small input voltage. Outlines 2 and 14C, respectively, OUTLINES 6SJ7-GT is used principally for renewal purposes.

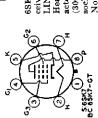
Heater Voltage (ac/dc). Heater Current Direct Interelectrode Capacitances for 6SJ7.º	8.0 8.0	volts ampere
hode, Heater, Grid No.2, and Grid No.3, , Heater, Grid No.2, and Grid No.3	0.005 max 6.0 7.0	i d
Triode Connection: " Grid No.1 to Plate. Grid No.1 to Cathode and Heater. Plate to Cathode and Heater.	01 to 60 44 *	i jd
• With shell connected to eathode. • With grids No.2 and No.3 connected to plate.	=	jd

Technical Data

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Center Values):		Triode Connection*	Pentode Connection	
PLATE VOLTAGE.			300 max volts	volts
GRID-NO.2 SUPPLY VOLTAGE.		1	300 max	volts
GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive	e-bias value	o max	0 max	volts
PLATE DISSIPATION			7. J. Wax	3
For grid-No.2 voltages up to 150 volts			0.7 max	watt
For grid-No.2 voltages between 150 and 300 volts.	00 volts	1	See curve page 70	page 70
PEAN HEATER-CATHODE VOLINE: Heater negative with respect to eathode	:	30 max	90 max	volts
Heater positive with respect to cathode.		90 max	90 max	volte
	Triode	Pentode		
Typical Operation:	Connection*	Connection	2	
Plate Voltage	250	100	250	voiti
	ı	Connected to cathode at socket	thode at sock	
	1	100	100	volte
Grid-No.1 Voltage		ទុ	ရာ	volte
Amplification Factor	7600	200000	1+	do
		1575	1650	oqu.
for plate		9	0	. 1
Plate Current 6.0	o o	61	3.0	
		6.0	8.0	ä
* Grids No.2 and No.3 connected to plate.	† Greater than 1 megohm.	1 megohm.		

REMOTE-CUTOFF PENTODE



6SKT-GT used as rf or if amplifiers in radio receivers. Outlines 2 and 14C, respectively, OUT-LINES SECTION. Tubes require octal socket. Metal type 6SK7 and glass octal type Heater volts (ac/dc), 6.3; amperes, 0.3. Characteristics as class A₁ amplifier: plate volts, 250 (300 max); grid No.3 connected to cathode at socket; grid-No.2 volts, 100 (300 max); grid-

125K7, 125K7GT

65K7G1 Related types: oc. apv. "c.".
No. 1 volts, -8 (0 max); plate resistance (approx.),
0.8 megohm; transconductance, 2000 µmhos; plate ma., 9.2; grid-No.2 ma., 2.6; plate dissipation, 4 max
watts; grid-No.2 input, 0.4 max watt; peak heater-cathode volts, 90 max. These types are used principally for renewal purposes.

HIGH-MU TWIN TRIODE

verter in radio equipment. Each unit LINES SECTION. Tube requires may also be used in resistance-coupled amplifier circuits. Outline 14C, OUT-Glass octal type used as phase in-

each triode unit is independent of the other. For typical operation as phase inverter or resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER octal socket and may be mounted in any position. Except for the common heater SECTION

volts ampere	ăăă
 0.3 8.8	Unit No. 2 2.8 3.4 3.2
Heater Voltage (ac/dc) 6.3 Heater Current 0.8	DIRECT INTERELECTRODE CAPACITANCES (Approx.).* Unit No. 1 Grid to Plate. 2.8 Grid to Cathode and Heater. 3.0 Plate to Cathode and Heater. 3.0 Plate to Cathode and Heater. 3.8

CLASS A, AMPLIFIER (Each Unit)

	volts	AO TB	1184	voits	volts
	300 max	n max	I max	90 max	30 max
Maximum Ratings, (Design-Center Values):	PLATE VOLTAGE	GRID VOLTAGE, Positive-bias value	PLATE DISSIPATION.	Heater negative with respect to cathode	Heater positive with respect to cathode

34.1

Characteristics:

ohma ¤mhos
 Plate Voltage
 250

 Grid Voltage
 70

 Amplification
 70

 Plate Resistance (Approx.)
 44000

 Transconductance
 1600

 Plate Current.
 2.3
 Plate Current......

2

6SN7GTA 6SN7GT

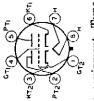
MEDIUM-MU TWIN TRIODE

Glass octal types used as combined ceivers. Each unit may also be used in vertical oscillators and vertical deflection amplifiers, and as horizontal deflection oscillators, in television re-

6SNZGTB

125N7GT, 125N7GTA

Related types:



may be mounted in any position. Except for the common heater, each triode unit is multivibrator or resistance-coupled amplifier circuits in radio equipment. Type 6SN7-GTB has a controlled heater warm-up time to permit use in series-connected heater strings. Outline 14C, OUTLINES SECTION. Tubes require octal socket and independent of the other. For typical operation as resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER SECTION. Types 6SN7-GT and 6SN7-GTA are DISCONTINUED types listed for reference only.

vol ampe secon	
6.3 0.6 11 17nit No.2	3.8 0.7
HEATER VOLTAGE (AC/DC) HEATER CURRENT HEATER WARN-UP TIME (Average) for 6SNT-GTB DIRECT INTERELECTRODE CAPACITANCES (Approx.) for 6SNT-GTB:	Grid to Plate. 4.0 Grid to Cathode and Heater. 2.2 Plate to Cathode and Heater. 0.7

ಕ್ಷಕ್ಷ

	volts ma	watts	volts volts	volts volts ohms µmhos
6SN7-GTB	450 max 20 max	5 max 7.5 max	200 max 200°max	250 8 20 77700 2600
CLASS A ₁ AMPLIFIER (Each $Unit$) Maximum Ratinas, (Design-Center Values):	PLATE VOLTAGE. CATHODE CURBENT.	For either plate. For either plate. For both plates with both units operating.	Peak Harter-Cathods Voltage: Heater negative with respect to cathode. Heater positive with respect to cathode.	Characteristics: 90 Plate Voltage. 90 Grid Voltage. 0 Amplication Factor 20 Plate Resistance (Approx.) 6700 Transconductance. 3000

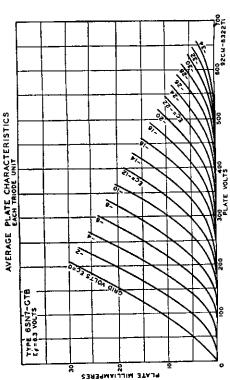


Plate Current for grid voltage of -12.5 volts Grid Voltage (Approx.) for plate current of 10 \(\text{pa} \)	9 1.3 -18	ma ma volta
Maximum Circuit Value: Grid-Circuit Resistance: For fixed-bias operation	1.0 мах	1.0 max megohm

= Technical Data =

OSCILIATOR (Rack Unit)

For overation in a 525-line, 30-frame system	me system		
	6SN7-GTB	r.B	
	Vertical Deflection	Horizonta Deflection	
Maximum Ratings, (Design-Center Values):	Oscillator	Oscillator	
DC Plate Voltage	450 max	450 max -600 max	Yor
PEAK CATHODE CURRENT AVERAGE CATHODE CURRENT	70 max 20 max	300 max 20 max	88
PLATE DISSIPATION: FOR either plate. For both plates with both units operating.	5 max 7.5 max	5 max 7.5 max	wat
PEAK HEATER-CATHODD VOLTAGE: Heater negative with respect to cathode Heater positive with respect to cathode	200 max 200°max	200 maz 200°maz	vol
Maximum Circuit Value: Grid-Circuit Resistance	2.2 max	2.2 max megoh	тевоћ
VERTICAL DEFLECTION AMPLIFIER (Back Unit) For operation in a \$25-line, 30-frame system Maximum Ratings, (Design-Center Values):	R (Each Unit) sme system	6SNT-GTB	

tts tts tts tts tts

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	volts	Voits	VOILB	É	8 0	4	WELLS	March 1	141	4010a	S IOA
O TO- I ATOO	450 max	1500-max	200 mar	10 max	zo max))	20 March	row e	000	2000 3362	200 mate
Maximum Ratings, (Design-Center Values):	DC PLATE VOLTAGE.	PEAR POSITIVE-PULSE PLATE VOLTAGE # (Absolute maximum)	PEAK NEGATIVE-PULSE GRID VOLTAGE,	PEAK CATHODE CURRENT	AVERAGE CATHODE CURRENT	PLATE DISSIPATION:	For either plate	For both plates with both units operating	PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode	Heater positive with respect to cathode

Maximum Circuit Yalue:

Grid-Circuit Resistance: For cathode-bias operation.

The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a faze-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

Under no circumstances should this absolute value be exceeded.

2.2 max megohms

o The dc component must not exceed 100 volts. P02(4)



TWIN DIODE—HIGH-MU TRIODE

6507

receivers. Outlines 2 and 14C, respectively, OUTLINES SECTION. Tubes type 6SQ7-GT used as combined detector, amplifier, and ave tube in radio Metal type 6SQ7 and glass octal

6SQ7G Related types: 125Q7, 125Q7GT

require octal socket and may be mounted in any position. These types are similar electrically to type 6Q7 in many respects, but they have a higher-mu triode. Diodebiasing of the triode unit is not suitable because of the probability of triode platecurrent cutoff even with relatively small signal voltages applied to the diode cir-8 3 cuit. Type 6SQ7-GT is used principally for renewal purposes. BC:6507-6T

volts ampere	p p p
9 0 3	6.64 6.64 6.64 6.64
IEBATER VOLTAGE (AC/DC). IEBATER CURRENT JRECT INTERELECTRODE CAPACITANCES for 6SQ7:°	Priode Unit: Grid to Pathole and Heater Grid to Cathode and Heater Plate to Cathode and Heater

3.3 max 0.08 max 0.04 max	
Bither Diode Plate to Cathode and Heater. Triode Grid to Plate of Diode No.1. Triode Grid to Plate of Diode No.2. With shell connected to cathode.	

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	AMPLIFER	
	ż	
	CLASS ,	
	Ş	
	TRIODE UNIT AS CLASS A	
	ž	
	_	
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volta volta volta volta	volts volts ohms umbos
300 max 0 max 0.5 max 90 max	250 -2 100 85000 1175
ximum Ratings, (Design-Center Values): TER VOLTAGE. ID VOLTAGE, Positive-bias value. TRE DISSIEATION THE BASE-CATHOGY OFTAGE! Heater negative with respect to eathode. Heater positive with respect to cathode.	100 -1 -1 110000
s): ode	
Design-Center Value ive-bias value odd Voltage: nith respect to cath	prox.)
Maximum Ratings, (Design-Center Values): PLATE VOLTAGE GRID VOLTAGE, Positive-bias value. PLATE DISSIPATION PLATE MAREA-CATHODE VOLTAGE; PRAFE HEAVER-CATHODE VOLTAGE; Heater negative with respect to eathode	Characteristics: Plate Voltage. Grid Voltage. Amplification Factor. Plate Resistance (Approx.) Transconductance.

DIODE UNITS

Maximum Rating, (Design-Center Value):

PLATE CURRENY (Each Unit).

Two diode plates are placed around a cathode, the sleeve of which is common to the triode unit. Each diode plate has its own base pin. For diode operation curves, refer to type 6AV6.

TWIN DIODE -- MEDIUM-MU TRIODE

mum ratings and typical operation of triode unit as class A ampifier: plate volts, 250 max; plifier, and ave tube. It is equivalent in performance to miniature type 6BF6. Outline 2, OUTLINES SECTION. Tube requires octai Metal type used as combined detector, am-Heater volts (ac/dc) 6.3; amperes, 0.3. Maxisocket and may be mounted in any position.

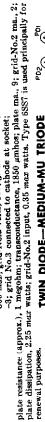
12587



grid volts,—9; amplification factor, 16; plate resistance (approx.), 8500 ohms; transconductance, 1900 mmhos; plate ma., 9.5; plate dissipation, 2.5 max watts; peak heater-cathode volts, 90 max. For diode-operation curves, refer to type 6AV6. Type 6SR7 is used principally for renewal purposes.

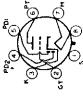
REMOTE-CUTOFF PENTODE

Metal type used in rf or if stages of radio receivers particularly those employing avc. Outline 2, OUTLINES SECTION. Tube requires volts, 250 (300 max); grid-No.2 supply volts, 300 max; grid-No.2 volts, 100; grid-No.1 volts, -3; grid No.3 connected to cathode at socket; tion. Heater volts (ac/dc), 6.3; amperes, 0.15. Typical operation as class A: amplifier: plate octal socket and may be mounted in any posi-



6BF6 except for interelectrode capacitances and heater current. Outline 2, OUTLINES SECTION, Tube requires octal socket and may be TWIN DIODE-MEDIUM-MU TRIODE Metal type used as combined detector, amplifier, and ave tube. Within maximum ratings this type is electrically identical to type mounted in any position. Heater volts (ac/dc),

6.3; amperes, 0.15. Maximum ratings of triode some distribution of triode operation out as class A1 amplifier: plate volts, 250 maz; plate dissipation, 2.5 maz watts. For diode operation curves, refer to type 6AV6. Type 6ST7 is a DISCONTINUED type listed for reference only. plifier, and ave tube in radio receivers. Except Metal type used as combined detector, amfor heater-current rating and interelectrode capacitances, this type is essentially the same elec-TWIN DIODE-HIGH-MU TRIODE



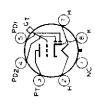
= Technical Data

MEDIUM-MU TRIODE

sistor, 150 ohms; plate ma., 18; amplification factor, 13; transconductance, 7000 µmhos. Max-Miniature type used as oscillator in tuners of uhf television receivers. Outline 7A, OUT-LINES SECTION. Tube requires miniature seven-contact socket, Heater volts (ac/dc), 6.3; amperes, 0.225. Characteristics as class A; amplifier: piate-supply volts, 80; cathode-bias reimum ratings as oscillator in uhf television re-

ceivers: plate volts, 200 max; grid ma., 8 max; catbode ma., 30 max; plate dissipation, 3.5 max watts; peak heater-cathode volts, 50 max. This type is used principally for renewal purposes.

TWIN DIODE-HIGH-MU TRIODE



transconductance, 1050 µmhos. For diode operation curves, refer to type 6AV6. Type 6T7-G is a DISCONTINUED type listed for reference amplifier, and ave tube in radio receivers. Outline 23, OUTLINES SECTION. Heater volts as class A1 amplifier: plate volts, 250 mar; grid Glass octal type used as combined detector, (ac/dc), 6.3; amperes, 0.15. Typical operation volts, -3; plate ma., 1.2; plate resistance (approx.), 62000 ohms: amplification factor, 65.

TRIPLE DIODE—HIGH-MU TRIODE

detector in AM/FM radio receivers. tection, and diode units No.2 and No.3 audio amplifier, AM detector, and FM Diode unit No.1 is used for AM de-Miniature types used as combined KT, DIAD3

(e)

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Related types: 518, 1918 **618A**

are used for FM detection. Type 6T8-A has a controlled heater warm-up time for use in receivers employing series-connected heater strings. Outline 8B, OUTLINES SECTION. Tubes require miniature nine-contact socket and may be mounted in SISTANCE-COUPLED AMPLIFIER SECTION. Type 6T8 is a DISCONTINany position. For typical operation as resistance-coupled amplifier, refer to RE-UED type listed for reference only. ē

HEATER VOLFAGE (AC/DC). HEATER CURRENT. HEATER WARM-UP TIME (Average) for 6T8-A. Without	Without	6.3 0.45 11 With	volts ampere seconds
DIRECT INTERELECTRODE CAPACITANCES for 6T8-A: Triode Unit:	External Shield	External Shield*	•
Grid to Plate. Grid to Cathode, Internal Shield upin 7, and Heater. Pleas to Cathode Internal Shield upin 7), and Heater.	- 9.6	:-! 	55
Diode Units: Diode-No.1 Plate to Cathode, Internal Shield (pin 7),	1	i i	i.
and Heater Diodo-No.2 Plate to Cathode, Internal Shield on 3).	တ က	80 80	þţ
and Heater Diode-No.3 Plate to Cathode, Internal Shield (pin 7).	80 80	8 8	ğ
and Heater Diode No 2 Cathode Internal Shield (bin 3) to All Other	3.4	3.6	ď
	7.5 0.034 max	8.5 0.034 max	ቯ፟፟፟፟
* With external shield connected to pin 7 except as noted. • With external shield connected to pin 3. ■ With external shield connected to pins 4 and 5.			

TRIODE UNIT AS CLASS A, AMPLIFIER

volts volts	volts
830 max 0 max	100 max 100 max
Maximum Ratings, (Design-Maximum Values): PLATE VOLTAGE PRIP VOLTAGE, Positive bias value.	PEAK HEATER-(ATROND VOLTAGE: REAUTH CATTER (ATROND VOLTAGE: HEAUTH negative with respect to cathode Heater positive with respect to cathode

reference only.

volts (ac/dc), 6.3; amperes, 0.15. For diode operation curves, refer to type 6AV6. Type 6SZ7 is a DISCONTINUED type listed for

trically as type 6AT6, Outline 2, OUTLINES

SECTION. Tube requires octal socket. Heater

Characteristics: RCA Receiving Lube Manual	Ì						•	
Characteristics: Characteristics: Plate Voltage Grid Voltage Amplification Factor. Plate Resistance (Approx.) Transconductance 1300 1300		į	220	ָרְ בְּי	28000	1900	1 0	
Characteristics: Plate Voltage Grid Voltage Plate Resistance (Approx.) Transconductance.	! !		100	1 6	000	1900	200	
Characteristics: Plate Voltage Grid Voltage Amplification Factor Transconductance	Manu		:	:	:		:	
Characteristics: Plate Voltage Grid Voltage Amplification Factor Plate Resistance (Approx.) Transconductance	I ube				:			
Characteristics: Plate Voltage Grid Voltage Amplification Factor. Plate Resistance (Approx.) Transconductance	(eceiving							
Characteristics: Plate Voltage Grid Voltage Maplification Factor Plate Resistance (Approx. Transconductance.	KCA I							
		Characteristics:	Plate Voltage	Grid Voltage	Amplification Factor	Plate Resistance (Approx.	Transconductance	

3	ָרָרָי קיין	2000	0000	-	-	
307	1 6	0.00	1900	not o	o -	
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	8	n Factor	ance (Approx.)	ctance, ,	nt.,na	,
94	a)	₽	αţ	U	⊒	

DIODE UNITS

Plate Currer

011	8111		voles offer	en 10 a
7.	5.5 max		100 1101	TAU WILL
Maximum Ratings, (Design-Maximum Values):	PLATE CURRENT (Each Unit)	PEAK HEATER-CATHODE VOLTAGE (Unit No.2):	Heater negative with respect to cathode	Heater positive with respect to cathode

AVERAGE PLATE CHARACTERISTICS TRIODE UNIT > LATE VOLTS 1 TYPE 6T8-A E4 = 6.3 VOLTS

ELECTRON-RAY TUBE

92CM- 7063T

mensions: over-all length, 4-3/16 inches; seated means of a fluorescent target, the effects of a change in a controlling voltage. It is used as a convenient, non-mechanical means of indicating height, 3-9/16 inches; diameter, 1-3/16 inches. Glass type used to indicate visually, by accurate radio-receiver tuning. Maximum di-

operation in indicator service: plate- and target-supply volts, 250 (285 max); target-supply volts, 125 min; series triode-plate resistor, 1 megohm; target ma., 4; triode-plate ma., 0.24; triode-plate dissipation, 1 max watt; triode-grid volts (approx.), -22 for 0° shadow angle, 0 for 90° shadow angle; Tuberquires in-contact socket. For a discussion of electron-ray tube considerations, refer to of electron-ray tube considerations, refer to ELECTRON TUBE APPLICATIONS SECTION. Heater volts (ac/dc), 6.3; amperes, 0.3. Typical peak heater-cathode volts, $90\ max$. This type is used principally for renewal purposes.

REMOTE-CUTOFF PENTODE

a mixer in superheterodyne circuits. Maximum over-all length, 4-7/8 inches; maximum diameter, 1-9/16 inches. Tube requires octal Typical operation as class A1 amplifier: plate Glass octal type used in rf and if stages of radio receivers employing ave. It is also used as socket. Heater volts (ac/dc), 6.3; amperes, 0.3.



volts, 250 (300 max); grid-No.2 supply volts, No. 300 max; grid-No.2 supply volts, 100; grid No.3 connected to cathode at socket; grid-No.1 volts, 3; plate resistance (apprax.), 0.8 megohm; transconductance, 1600 mmhos; plate ma., 8.2; grid-No.2 ma., 7; plate dissipation, 2.25 max watts; grid-No.2 input 0.25 max watt. This is a DISCONTINUED type listed for reference only.

= Technical Data ==

MEDIUM-MU TRIODE-® KT

ohma mhos

voits volts

Miniature types used as combined oscillator and mixer tubes in television receivers utilizing an intermediate frequency in the order of 40 megacycles SHARP-CUTOFF PENTODE

Retated types: SUB, 9UBA **6U8**

trolled heater warm-up time for use in television receivers employing series-connected heater strings. Outline 8B, OUTLINES SECTION. Tubes require miniature nine-contact socket and may be mounted in any position. Type 6U8 is a DISper second. Type 6U8-A has a con-CONTINUED type listed for reference only.

HEATER VOLTAGE (AC/DC)		6.3	volts
HEATER CURRENT. Unamer With Its Time (Augusta) for 618-4	:	0.45	ampere
DEALER WARM-OF LIME (A Telage) to oco at	Without	With	seconds
DIRECT INTERELECTRODE CAPACITANCES:	External	External	
Triode Unit:	Shield	Shield	
Grid to Plate	1.8	1.8	jū
Grid to Cathode, Heater, Pentode Cathode, Pentode Grid			L
No 3 and Internal Shield	00	80	ď
Plate to Cathode Heater, Pentude Cathode, Pentude Grid			\$
No 9 and Internal Shield	5	63	7
Total and the state of the stat	, i	l	ī.
Pentode Unit:			
Grid No.1 to Plate	0.010 max	0.006 max	Ja
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and			•
Internal Shiple	5.0	5.0	jū
Plate to Cathode Heater, Grid No.2, Grid No.3, and In-			
tornal Shield	2.6	10	
Twings Cathoda to Mostor	. 65		ŗ
Pentode Cathode, Pentode Grid No.3, and Internal Shield to	,	,	į,
Heater	ಣ	•	μ
o.1 to Tric	0.2 max	0.2 max	<u>,</u> Z
Pentode Plate to Triode Plate	0.1 max	0.02 max	Įd.
 With external shield connected to pin 4 except as noted. With external shield connected to pin 6. 			

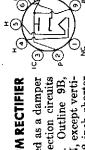
CLASS A, AMPLIFIER			
Maximum Ratings, (Design-Maximum Values):	Triode Unit	Triode Unit Pentode Unit	
PLATE VOLTAGE.	330 max	330 max	volts
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE	r	330 max	volts
GRID-No.2 Voltage	ı	See curve page 70	page 70
GRID-No.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	0 max	0 max	volts
PLATE DISSIPATION	2.5 max	3 max	watte
GRID-No.2 INPUT:			
For grid-No.2 voltages up to 165 volts.	i	0.55 max	watt
For grid-No.2 voltages between 165 and 330 volts	1	See curve page 70	page 70
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	200 max	200 max	volts
Heater positive with respect to cathode	200 max	200 max	volts
Heater positive with respect to cathode	200 max	200 max	Vol

Characteristics:	Triode Unit	Triode Unit Pentode Unit	
Plate Voltage	125	125	¥
Grid-No.2 Voltage	١	110	À
Grid-No.1 Voltage	-	-1	>
Amplification Factor	40	i	
Plate Resistance (Approx.)	ı	0.5	mego
Transconductance	7500	5000	Tu n
Grid-No.1 Voltage (Approx.) for plate current of 20 µa	6	œ	×
Plate Current,	13.5	9.2	
Grid-No.2 Current	ı	3,5	
The dc component must not exceed 100 volts.			

alts alts volt

hos olts ma

Miniature type used as a damper tube in horizontal deflection circuits OUTLINES SECTION, except vertical dimensions are 7/32 inch shorter of television receivers. Outline 9B,



than shown. Tube requires miniature nine-contact socket and may be mounted in any position. It is especially important that this tube, like other power-handling tubes, be adequately ventilated. Heater volts (ac/dc), 6.3; amperes, 1.75.

DAMPER SERVICE

Heater positive with respect to cannot a second 15 per cent of one horizontal scanning cycle. In a	AK HEATER-CATHODE VOLTAGE: 67501#max Heater negitive with respect to cathode # (Absolute Maximum). 800° max Hater negitive with respect to cathode # (Absolute Maximum).	Peak Inverses Plate Voltage# (Absolute Maximum) Peak Plate Current 800 max BC Plate Current 135 max
in respect to cathoder	DE VOLTAGE: th respect to cathode# (Absolute Max b respect to cathode	
legter positive with respect to ca	PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to Ca	K PLATE CURRENT.

#The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds. In funder no circumstances should this absolute value be exceeded.

The dc component must not exceed 750 volts.

The dc component must not exceed 100 volts.

6V6GT 9/9

BEAM POWER TUBE

battery-operated, and other receivers in which reduced plate-current drain types 6V6-GT and 6V6-GTA are used as output amplifiers in automobile, Metal type 6V6 and glass octal **6V6GTA**

Related types:

is desirable. Outlines 5, 14C, and 14C, respectively, OUTLINES SECTION. Type may be mounted in any position. These tubes are equivalent in performance to type 6AQ5-A. Refer to type 6AQ5-A for average plate characteristic curves. Type 6V6-GT may be supplied with pin No.1 omitted. Tubes require octal socket and 6V6-GT is a DISCONTINUED type listed for reference only. **5V6GT, 12V6GT**

		315 max	64	•••		316 225
οź						250 550
AMPLIFIE						180
CLASS A, AMPLIFIER	Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE. GRID-NO.2 (SCREEN-GRID) VOLTAGE.	PLATE DISSIPATION. GRID-NO.2 INPUT	PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode.	Heater positive with respect to cathode	Typical Operation: Plate Voltage

ob de de de de de de de de de de de de de	
221 122 133 133 133 133 133 133 133 133	
2221-12-256-256-256-256-256-25-4-4-7-7-5-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6-6	•
1180 180 180 180 180 180 180 180 180 180	1
Heater positive with respect to catalous Typical Operation: 180 250 Plate Voltage 180 250 Grid-No.2 Voltage 8 5 12.5 Grid-No.1 (Control-Grid) Voltage 8 5 12.5 Peak AF Grid-No.1 Voltage 8 5 12.5 Peak AF Grid-No.1 Voltage 8 5 12.5 As immun-Signal Plate Current 30 4.5 Bero-Signal Grid-No.2 Current 3 4.5 Pare-Signal Grid-No.2 Current 3 4.5 Plate Resistance (Approx.) 50000 50000 Land Resistance 50000 50000 Load Resistance 50000 50000 Load Resistance 50000 50000 Transconductance 50000 50000 Load Harmonic Distortion 8 8 5 12.5 Transconductance 50000 50000 Total Harmonic Distortion 8 8 5 12.5 Tangenda Resistance 50000 50000 Total Harmonic Distortion 6 6 6 6 Total Harmonic Distortion 6 6 6 6 6 Total Harmonic Distortion 6 6 6 6 6 6 6 6 6	Maximum-Signal Fower Output

Characteristics (Triode Connection):*

= Technical Data ==

volts volts	ohms ma voits		volts volts	volts volts	i i	8 8	ohms per cent watts	megohm megohm
250 -12.5	1950 5000 49.5 -36		285 285	51-88 88	8 2 8	13,5	8000 3.5 14	0.1 max 0.5 max
		## #	250 250	30 -12	7. 26.	بد <u>م</u>	10000 5 10	
Plate Voltage Grid-No.1 (Control-Grid) Voltage.	Amplinication factor. Pransconductance Plate University Grid-No.1 Voltage (Approx.) for plate current of 0.5 ma. Grid No.2 connected to plate.	PUSH-PULL CLASS A, AMPLIFIER class A, amplifier)						ximum Circuit Values: d-No.1-Circuit Resistance: For fixed-bias operation.
	or plate current of 0	PUSH-PULL CLASS A Maximum Ratings: (Same as for class A, amplifier) Tvoical Operation (Values are for two tables):	Plate Voltage. 3rid-No.2 Voltage	Grid-No.1 (Control-Grid) Voltage Peak AF Grid-No.1-to-Grid-No.1 Voltage	Zero-Signal Plate Current	1	Effective Load Resistance (Plate-to-Plate) Total Harmonic Distortion Maximum-Signal Power Output.	
rid) Voltage.	prox.)pprox.) for pl	PUSH-PULL (Maximum Ratings: (Same as for class A, am Froical Operation (Values are for two tubes):		irid) Voltage o-Grid-No.1 V	rrent.	2 Currentd-No.2 Currer	ance (Plate-to ortion	lues: sistance: ration
oltage	Amplineation #actor Plate Resistance (Approx.) Transconductance Plate Curent. Grid-No.1 Voltage (Approx.) for	um Ratings: (S Operation (oltage	o.1 (Control-C F Grid-No.1-t	gnal Plate Cur nm-Signal Pla	gnal Grid-No.	re Load Resist Iarmonic Dist um-Signal Pot	Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation.
Plate V.	Ampling Plate R Transco Plate C Grid-Nc	Maximu Typical	Plate V Grid-N	Grid-N	Zero-Sig	Zero-Si	Effectiv Total B Maxim	Maximi Grid-Na For For

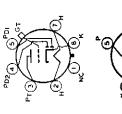
VERTICAL DEFLECTION AMPLIFIER (Triode Connection)*

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Maximum Ratings, (Design-Maximum Values):

2.2 мах тедовтв	2.2 max	Maximum Circuit Value: Grid-No.1-Circuit Resistance: For cathode-bias operation
volta volta	200 max 200 max	FERK REATER-CATHOUS volvans. Heater negative with respect to cathode. Heater positive with respect to cathode.
ma watts	40 maz 10 maz	AVERAGE CATHODE CURRENT. PLATE DISSIPATION VOLUME TO SERVICE TO SE
SECT.	115 max	PEAK CATHODE CURRENT.
volts volts	1200 max 275 max	Peak Positive-Pulse Plate Voltage# Peak Negative-Pulse Grid-No.1 (control-grid) Voltage
volta	350 max	DC PLATE VOLTAGE

The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds. The dc component must not exceed 100 volts.



watts watts volts volts

TWIN DIODE-LOW-MU TRIODE

amplifier, and ave tube. Outline 23, OUT-LINES SECTION, Except for interelectrode capacitances, this type is identical electrically with type 85. Heater voits (asc/dc), 6.3; amperes, 0.3. For diode operation curves, refer to type 6AV6. Type 6V7-G is a DISCONTINUED type listed for reference only. Glass octal type used as combined detector,



HALF-WAVE VACUUM RECTIFIER

tube in television receivers. Outline 14C,OUTLINESSECTION.This type Glass octal type used as damper may be supplied with pin No.1 omitted. Tube requires octal socket and may

be mounted in any position. Socket terminals 1, 2, 4, and 6 should not be used as tie points. It is especially important that this tube, likeother power-handling tubes, be adequately ventilated. Power-rectifier operation of this type is not recommended.

voits amperes	g d d	
بر در م	133	
HEATER VOLTAGE (AC)	HEATER CURRENT DIRECT INTERELECTRODE CAPACITANCES (Approx.): Plate to Cathode and Heater Cathode to Plate and Heater Heater to Cathode	DAMPER

For operation in a 525-line, 30-frame system

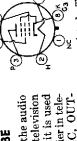
La Company		
Maximum Ratings, (Design-Center Values): Peak Inverse Plate Voltage (Absolute Maximum)* Peak Plate Current DC Plate Current	3850 max 750 max 125 max 3.5 max	volts ma ma watts
PLATE DISSIPATION PLATE DISSIPATION PBAK HEATER-CATHODE VOLTAGE. Heater negative with respect to cathode (Absolute Maximum)* Heater positive with respect to cathode.	2300 max 300 max	volts
Characteristics, Instantaneous Value: Tube Voltage Drop for plate current of 250 ma Tube Voltage Drop for plate current of 250 ma * The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a * The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle is 10 microseconds.	21 Il scanning cyc roseconds.	volts de. In a
525-line, 30-frame system, 15 per cent of one inclined and 525-line, 30-frame system, 15 per cent of one inclined and system.		

The dc component must not exceed 500 volts.
 ↑ The dc component must not exceed 100 volts.

BEAM POWER TUBE

receivers. Triode-connected, it is used as a vertical deflection amplifier in tele-Glass octal type used in the audio output stage of radio and television

> **6W6GI** Related type: 12W6GT



LINES SECTION. This type may be supplied with pin No.1 omitted. Tube vision receivers. Outline 14C, OUT-

requires octal socket and may be mounted in any position.

volts

7 7 7 7 7 7 7

amperes 6.3 9.8 15 Heater Voltage (ac/dc)

Heater Current Current Caroline Caracteringes: (Approx.):
Grid No.1 to Plate.
Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3
Plate to Cathode, Heater, Grid No.2, and Grid No.3

CLASS A1 AMPLIFIER

volts volts watts	volts volts
330 max 165 max 12 max 1,35 max	200 max 200smax
Мaximum Ratings, (Design-Maximum Values): Plate Voltage Grid-No.2 (screen-grid) Voltage Plate Dissipation	(ind-No.2 in-Vol.) Peak Heater-Cathods Voltage: Heater negative with respect to cathode

AVERAGE PLATE CHARACTERISTICS Heater negative with respect to cathode.

Heater positive with respect to cathode.

The dc component must not exceed 100 volts.

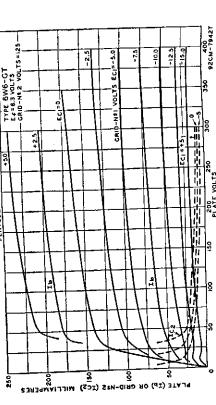


Plate Supply Voltage.	125	volts
Voltage	Į.	volts
	180	em do
	œ.	Volts
lignal Plate Current	04.	
	- ¢	T C
ignal Grid-No.2 Current.	40	i i
č	0,000	H 4
	28000	onms
	0000	Arithus Arithus
Load Resistance	100	200 200
Fotal Harmonic Distortion (Approx.)	ر عور عور	watte
Characteristic (Triode Connection)*:		
	225	volts
Table Violation	-30	volta
ALL INCREMENT OF A PARTY OF A PAR	6.2	
Ampuncation favors	1600	ohms
includes on the property of th	3800	*mpos
Control	55	108
Caid No.1 Voltage (Approx.) for plate current of 0.5 ma.	-42	volta
Grid No. 2 connected to plate.		
Maximum Circuit Values:		
Grid-No.1 Gircuit Resistance: For fized-hiss operation. For cathode-hiss operation.	0.1 max 0.5 max	megohm megohm
VERTICAL DEFLECTION AMPLIFIER		
For operation in a 525-line, 30-frame system		
	Pentode	
ఫ	Connection	
	330 max	VOICE
PEAK POSITIVE-PULSE PLATE VOLTAGET	165 222	Volts
	TD11 COT	
•	105 max	VOILE
PEAK CATHODE CURBENT	25 met	
	S 17.00	ð
PLATE DISSIPATION	1.2 max	Watts
Heater negative with respect to cathode	200 max	volts
Heater positive with respect to caunoue		

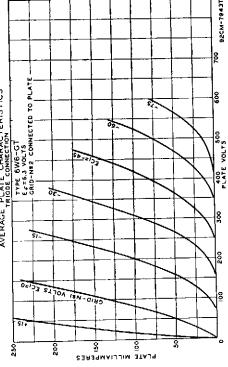
+ The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a \$52-ine, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

The de component must not exceed 100 volts. AVERAGE PLATE CHARACTERISTICS

2.2 max megohms

2.2 max

Maximum Circuit Value:



351

SHARP-CUTOFF PENTODE

or high-gain amplifier in radio receivers. Out-line 23, OUTLINES SECTION. Tube requires Glass octal type used as biased detector

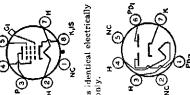
6W7G



grid) volts, 0 maz; plate dissipation, 9.5 maz max grid) volts, 0 maz; plate dissipation, 9.5 maz watt, Within its maximum ratings, this type is identical electrically with rype 6J7. Type 6W7-G is a DISCONTINUED type listed for reference only. max; grid-No.2 (screen-grid) volts, 100 max; grid-No.2 supply volts, 300 max; g.id-No.1 (controlperes, 0.15. Maximum ratings: plate volts, 300 octal socket. Heater volts (ac/dc), 6.3; am-

ply of automobile and ac-operated radio FULL-WAVE VACUUM RECTIFIER receivers. Equivalent in performance to larger types 6X5 and 6X5-GT. Type 6X4 requires miniature seven-contact Miniature type used in power sup-

Related type



It is especially important that this tube, like other power-handling tubes, be adequately ventilated. For discussion of Rating Chart and Operation Characteristics, socket and may be mounted in any position. Outline 7C, OUTLINES SECTION. refer to INTERPRETATION OF TUBE DATA. Heater volts (ac/dc), 6.3*; amperes, 0.6.

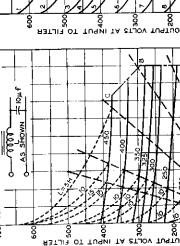
FULL-WAVE RECTIFIER

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(88)	
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(Design	;
Ratings,	
EXIMUM	
₹	

voits	m d	voits	m		volts	volte	
1250 max	245 max	350 max voits	45 maz	4 1.	450 mar	300	
Machines National Section 1250 max	STEADY-STATE PEAK PLATE CURRENT (Per Plate)	AC PLATE SUPPLY VOLTAGE (Per Plate, rms)	DC OUTPUT CURRENT (Each plate) †	HOT-SWITCHING TRANSIENT PLATE CURRENT.	Peak Heater-Cathode Voltage:	Heater negative with respect to cathode	Heater positive with respect to cathode

OPERATION CHARACTERISTICS

E F= 6.3 VOLTS SUPPLY FREQUENCY=60 CPS-CHOKES OF INFINITE INDUCTANCE ----- CHOKES OF VALUES SHOWN ---- BOUNDARY LINE FOR CHOKE VALUES SHOWN CBA = SEE RATING CHART TYPE 6X4 g



TION CHARACTERISTICS ACUIT, CAPACITOR INPUT TO FILTER	LTS PUT CAPACITOR = 10 LF PUT CAPACITOR = 10 LF SECO PLATE SUPPLY WHEEDANCE SECO CHANS FOR CURVES 1-5 AGO ONN'S FOR CURVES 6-8 RATING CHART			9	7	1	S Phys Pres		rJ /	7			7		40 60 80 100
OPERATION C	೬ ≵ಪಠಾಂ		\$/ \$/ \$		/ / ->	109		/ 3/	/ / / / /	เบลา เล	3/	/ 	3		20 27 40
ρ			EB	FILT	01	Tua	NI 21	1.5 A	T .	ruaı	כ טר	u 	Ι		ıδ

ohms henries Sine-Wave Operation Vibrator Operation Capacitor 10 101 340 340 325 10 525 AC Plate Supply Voltage (Each plate, rms) Filter Input Capacitor. Effective Plate Supply Impedance (Each plate). Filter Input Choke. DC Output Current, DC Output Voltage at Input to Filter (Approx.). Filter Input **Sypical Operation**

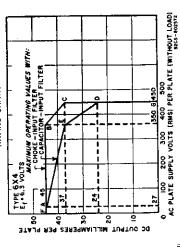
= Technical Data ===

· When the heater is operated from a 3-cell (nominal-6-voit) storage-battery source, the permissible This rating applies when the 6X4 is used in vibrator operation with a minimum duty cycle of 75 heater-voltage range is from 5 to 8 volts.

If hot-switching is regularly required in operation, the use of choke-input circuits is recommended. Such circuits limit the hot-switching current to a value no ingher than that of the peak plate current. When capacitor-input circuits are used, a maximum peak current value per plate of 1.1 amperes during the initial cycles of the hot-switching transient should not be exceeded.

 AC plate supply voltage is measured without load. The dc component must not exceed 100 volts.

RATING CHART



FULL-WAVE VACUUM RECTIFIER

ceivers. Outlines 5 and 14C, respectively, OUTLINES SECTION. Type ply of automobile and ac-operated retype 6X5-GT are used in power sup-Metal type 6X5 and glass octal

missible if pins 3 and 5 are in horizontal plane. Type 6X5-GT may be operated in 6X5-GT may be supplied with pin No.1 omitted. Both types require octal socket. Type 6X5 should be mounted in vertical position, but horizontal operation is perany position. For maximum ratings, and typical operation, refer to type 6X4. Type 6X5 is a DISCONTINUED type listed for reference only.

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

oscillator and mixer tube in television quency in the order of 40 megacycles per second. In such service, the 6X8 Miniature type used as combined receivers utilizing an intermediate fre-42,©

Related types: 5X8, 19X8

the triode unit is used as an oscillator for both sections. In the AM section, the pentode unit is used as a high-gain pentode mixer; in the FM section, the pentode signal-to-noise considerations. Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. gives performance comparable to that obtainable with a 6AG5 mixer and an oscillator consisting of one unit of a type 6J6. When used in an AM/FM receiver, unit is used either as a pentode mixer or as a triode-connected mixer depending on

32CM-803ITI

DC LOAD MILLIAMPERES

DC LOAD MILLIAMPERES 92CM-8030TI

A 08

ERAGE PLATE CHARACTERISTICS PENTODE UNIT

5X8 5X8 5 VOLTS	N 4	3 40713-4	 1									2.5			-0		
TYPE 6X8	SAID-NE	- CHO	 -				_	t		-2.0		١.		0.6-	1.0	-4.0	300
						<u></u>		-1.5			Ŀ	1			<u> </u>		230
	_	EC. = 0	 -	٩		1						<u>i</u> †				_	200
0		VOLTS E	1		L	1		I. I.	Ľ	_		1	ľ	_	ļ	1	8

WAVE VACUUM RECTIFIER

type used in power supply of radio refaximum dimensions: over-all length, thes; seated beight, 3-9/16 inches; di-9/16 inches; di-9/16 inches. Heater voits (ac/do), 6.3 0.8. The maximum at plate voitage is 350 volts (fms), and the dc output 60 ma. This is a DISCONTINUED if or reference only.

6Y5

BEAM POWER TUBE

uss octal types used as output ir in radio receivers. Also used arated, high-voltage power suptelevision equipment. Except

slope size and direct interelec-G and type 6Y6-GA are identical. Outlines 26 and S SECTION. Tubes require octal socket and may be

6Y6G 6Y6GA

	6.3	volts
	1.25	amperes
ces (Approx.): 6 Y6-G	6Y6-GA	
	0.7	፭
rid No.2, and Grid No.3	12	ā
	7.5	Έ
CLASS A, AMPLIFIER		
nlues):		
	200 max	volts
OLTAGE.	200 max	volts
	See cury	See curve page 70
) volts.	1.75 max	watts
100 and 200 volts	See curv	e page 70
	12.5 max watts	watts
cathode	180 max	volta
athode	180 max	volts
	200	volts
135	135	volta
	-14	Voite
	14	volts

Zero-Signal Plate Current.	88	61
Maximum Gional Plate Current	9	99
Maximum Digital Lines Controls	\$C	2.2
Zero-Signal Grid-in 0-14 N. B Current	1	i or
Maximum-Signal Grid-No.2 Cuffent	0000	
Plate Resistance (Approx.)	9300	18300
Transconductance	1000	7100
Load Resistance	2000	2600
Total Harmonic Distortion	10	2
Maximum-Signal Power Output.	9.6	9

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:

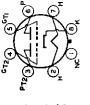
For cathode-bias operation..... For fixed-bias operation.

megohm megohm

0.1 max 0.5 max

HIGH-MU TWIN POWER TRIODE

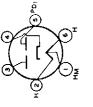
teristics, refer to type 79. Heater volts (ac/dc), 6.3; amperes, 0.6. This is a DISCONTINUED Glass octal type used as class B amplifier in output stage of radio receivers. Outline 22, OUTLINES SECTION. For electrical charactype listed for reference only.



Refer to type 84/6Z4

FULL-WAVE VACUUM RECTIFIER

parallel). Maximum ac plate volts (per plate), 230; maximum de output ma., 60. This is a DISCONTINUED typelisted for reference only. Glass type used in power supply of radio ameter, 1-9/16 inches. Heater volts (ac/dc), 12.6 (series), 6.3 (parallel); amperes, 0.4 (series), 0.8 4-3/16 inches; seated height, 3-9/16 inches; direceivers. Maximum dimensions: over-all length



G72(4) Glass octal type used as class B amplifier in output stage of radio receivers. Outline 22, OUTLINES SECTION. Tube requires octal socket, Heater volts (ac/dc), 6.3; amperes 0.3. HIGH-MU TWIN POWER TRIODE

signal plate ma, per plate 4.2; plate-to-plate load resistance, 12000 ohms; output watts, 4.2 with average input of 320 milliwatts applied between grids. This is a DISCONTINUED type listed for reference only. Typical operation and maximum ratings as class B power amplifier: plate volts, 180 max; grid volts, 0; peak plate ma. per plate, 60 max;

FULL-WAVE VACUUM RECTIFIER

radio equipment where economy of power is important, Outline 22, OUTLINES SECTION. in any position. Heater volts (ac/dc), 6.3; plate volts, 1256; peak plate ma. per plate, 120; dc output ma., 40; peak beater-cathode volts, 450. This is a DISCONTINUED type Glass octal type used in power supply of Tube requires octal socket and may be mounted amperes, 0.3. Maximum ratings: peak inverse isted for reference only.



Maximum ratings, typical operating conditions, and curves for type 7A4 are the same as for metal type 6J5. Type 7A4 is used principally

for renewal purposes.

fier, oroscillator in radio equipment. Outline 13A, OUTLINES SECTION. Tube requires lock-in

socket. Heater volts (ac/dc), 6.3; amperes, 0.3.

Glass lock-in type used as detector, ampli-

MEDIUM-MU TRIODE

= Technical Data

ohms ohms watte

па ma ma 4mhos per cent

BEAM POWER TUBE

quires lock-in socket. Heater volts (ac/dc), 6.3;
amperes, 0.75. Typical operation and maximum
ratings as class A1 amplifier; pate volts, 110 (125 maz);
grid-No.1 volts, 7.5; peak af grid-No.1 volts, 7.5; plate resistance (approx.), 16,000 ohms; transconin radio receivers in which the plate voltage Glass lock-in type used as output amplifier available for the output stage is relatively low. Outline 13B, OUTLINES SECTION. Tube re-

(maximum-signal, 7); load resistance, 2500 ohms; total harmonic distortion, 10 per cent; maximum-signal power output, 1.5 watts; peak heater-cathode volts, 90 max. This type is used principally for ductance 5800 μmhos; plate ma., zero-signal, 40 (maximum-signal, 41); grid-No.2 ma., zero-signal, 3 renewal purposes.

TWIN DIODE

Maximum ratings as rectifier: ac plate volts per plate (rms), 150; de output ma. per plate, et. Heater volts (ac/dc), 6.3; amperes, 0.15. volts, 330. The application of this type is similar to that of metal type 6H6. Type 7A6 is used Glass lock-in type used as detector, lowvoltage rectifier, or ave tube. Outline 13A, OUT-LINES SECTION. Tube requires lock-in sock-8; peak ma. per plate, 45; peak heater-cathode principally for renewal purposes.

REMOTE-CUTOFF PENTODE

in radio receivers. Outline 13A, OUTLINES SECTION. Tube requires lock-in socket. Heater volts (ac/dc), 6.3; amperes, 0.3. For maximum ratings, typical operation, and curves, refer to metal type 6SK7. Type 7A7 is used principally Glass lock-in type used as rf or if amplifier for renewal purposes.

OCTODE CONVERTER

superheterodyne circuits. Outline 13A, OUT-LINES SECTION. Tube requires lock-in sockquency converter; plate volts, 250 (300 maz); grids-No.3-and-No.5 volts, 100 maz; grid-No.2 Glass lock-in type used as converter in et. Heater volts (ac/dc), 6.3; amperes, 0.15. Typical operation and maximum ratings as fresupply volts, 250 applied through a 20000-ohm

dropping resistor (300 maz); grid-No.2 volts, 200 maz; plate dissipation, 1 maz watt; grids-No.3-and-No.5-input, O.75 maz watt; grid-No.2. volts, 3 (lonax); grid-No.1 resistor, 50000 ohms; plate ma., 3; grid-No.3-and-No.5 maz, 3.2; grid-No.2 ma., 4.2; grid-No.1 ma., 0.4; plate resistance (approx.), 0.7 megohm; conversion transconductance, 550 mmbos; peak heater-cathode volts, $90 \ max$. This type is used principally for renewal purposes.

POWER PENTODE

amplifier of television receivers. Outline 13B, OUTLINES SECTION. Tube requires lock-in Characteristics and maximum ratings as Class No.2 supply volts, 150 (300 max); grid-No.2 volts, see curve page 70; grid-No.1 volts, posi-Lock-in type used in output stage of video socket. Heater volts (ac/dc), 6.3; amperes, 0.6. At amplifier: plate supply volts, 300 max; grid-

No.2 voltages between 150 and 300 volts, see curre page 70); plate dissipation, 10 max watts; cathodebias resistor, 68 ohms; plate ma., 28; grid-No.2 ma., 7; plate resistance (approx.), 0.3 megohm; transconductance, 9500 µmhos; peak beater-cathode volts, 90 max. Type 7AD7 is a DISCONTINUED tive-bias value, 0 max; grid-No.2 input, for grid-No.2 voltages up to 150 volts, 1.2 max watts (for grid type listed for reference only.

MEDIUM-MU TWIN TRIODE

plate ma., 9; transconductance, 2100 µmhos; volts,

250 (300 max); grid volts, positive-bias phase inverter in radio equipment. Outline amplification factor, 16; plate resistance (ap-

Glass lock-in type used as voltage amplifier

0.3. Characteristics and maximum ratings as 13A,OUTLINESSECTION.Tube requires tockin socket. Heater volts (ac/dc), 6.3; amperes, Class A1 amplifier (each unit): plate supply value, 0 max; cathode-bias resistor, 1100 ohms;

principally for renewal prox.), 7600 ohms, peak heater-cathode volts, 90 max. This type is used

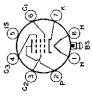
SHARP-CUTOFF PENTODE

low heater current drain is important. Outline 13A, OUTLINES SECTION, Tube requires Glass lock-in type used as rf amplifier in ac/de receivers or in mobile equipment where ings as class A1 amplifier: plate and grid-No.2 supply voits, 250 (300 max); grid-No.1 volts, lock-in socket. Heater volts (ac/dc), 6.3; amperes, 0.15. Characteristics and maximum rat-

max watts, grid-No.2 input, 0.75 max watt; grid No.3 and internal shield connected to cathode at socket; plate resistance (approx.), greater than 1 megohm; transconductance, 4200 μ mhos; cathodebias resistor, 250 ohms; plate ma., 6; grid-No.2 ma., 2; peak heater-cathode volts, 90 max. This type is positive-bias value, 0 max; plate dissipation, 2 used principally for renewal purposes.

SHARP-CUTOFF PENTODE

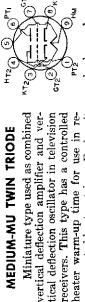
Glass lock-in type used as rf amplifier in high-frequency and wide-band applications. Outline 13A, OUTLINES SECTION, Tube reamperes, 0.15. Characteristics and maximum ratings as class A1 amplifier: plate and grid-No. 250 (see curve page 70); grid-No.1 volts, positive-blas value, θ max; plate dissipation, 2 max quires lock-in socket. Heater volts (ac/dc), 6.3; $2 \operatorname{supply volts}$, $250 \; (300 \; max)$; $\operatorname{grid-No.2 volts}$,



watts: grid-No.2 input, for grid-No.2 voltages up to 150 volts, 0.7 max watt (for grid-No.2 voltages from 150 to 300 volts, see curve page 70); cathode-bias resistor, 250 ohms; grid No.3 and internal shield connected to cathode at socket; plate resistance (approx.), I megohm; transconductance, 3300 mmhos; plate ma., 6.8; grid-No.2 ma.. 1.9; peak heater-cathode volts, 90 max. Type 7AH7 is used principally for renewal purposes.

MEDIUM-MU TWIN TRIODE

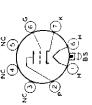
Miniature type used as combined vertical deflection amplifier and vertical deflection oscillator in television receivers. This type has a controlled



ceivers employing series-connected heater strings. Each unit may also be used as a sync separator and amplifier, and resistance-coupled amplifier circuits in radio equipment. Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), 7 in series arrangement, 3.5 in parallel arrangement; amperes, 0.3 (series), 0.6 (parallel); horizontal deflection oscillator, or in audio mixer, phase inverter, multivibrator, warm-up time (average) in parallel arrangement, 11 seconds. Except for heater ratings, this type is identical with miniature type 12AU7-A.

HIGH-MU TRIODE

this acteristics as metal types 6F5 and 6SF5. Type Glass lock-in type used in resistancecoupled amplifier circuits, Outline 13A, OUT-LINES SECTION. Tube requires lock-in socktype has the same maximum ratings and charet. Heater volts (ac/de), 6.3; amperes, 0.3 B4 is used principally for renewal purposes. Except for interelectrode capacitances,



- Technical Data

POWER PENTODE

TION, Tube requires lock-in socket. Heater volts (ac/dc), 6.3; amperes, 0.4. Except for interelectrode capacitances, this type is the same electrically as glass-octal type 6KG-GT. Type 7B5 is used principally for renewal Glass lock-in type used in output stage of radio receivers. Outline 13B, OUTLINES SECpurposes.

IWIN DIODE—HIGH-MU TRIODE

tector, amplifier, and ave tube. Outline 13A, OUTLINES SECTION. Tube requires lock-in socket. Heater volts (ac/dc), 6.3; amperes, 0.3. Glass lock-in type used as combined detype is the same electrically as metal type SSQ7. Type 7B6 is used principally for renewal interelectrode capacitances, Except for purposes.

REMOTE-CUTOFF PENTODE

in radio receivers employing ave. Outline 13A, OUTLINES SECTION. Tube requires lock-in -sod) Characteristics and maximum ratings as class A₁ amplifier: plate volts, 250 (300 max); grid-Glass lock-in type used as rf or if amplifier socket. Heater volts (ac/dc), 6.3; amperes, 0.15. itive-bias value, 0 max); grid No.3 and interna No.2 volts, 100 max; grid-No.1 volts, -3

shield connected to eathode at socket; plate ma., 8.5; grid-No.2 ma., 1.7; grid-No.2 input, 0.25 max watt; plate dissipation, 2.25 max watts; plate resistance (approx.) 0.75 megohm; transconductance, 750 mmhos; peak heater-cathode volts, 90 mar. Type 7B7 is used principally for renewal purposes.

PENTAGRID CONVERTER

Except for interelectrode capacitances, this type is the same electrically as metal type 6A8. Type OUTLINES SECTION. Tube requires lock-in socket. Heater volts (ac/dc), 6.3; amperes, 0.3. Glass lock-in type used as frequency converter in superheterodyne circuits. Outline 13A 7B8 is used principally for renewal purposes.

BEAM POWER TUBE

in radio receivers. Outline 13B, OUTLINES SECTION. Tube requires lock-in socket. Heater volts (ac/dc), 6.3; amperes, 0.45. Refer to metal type 6V6 for maximum ratings and typi-Glass lock-in type used as output amplifier cal operation as class A, amplifier and as pushpuli class A. amplifier. Type 7C5 is used principaily for renewal purposes.

IWIN DIODE—HIGH-MU TRIODE

Glass lock-in type used as combined detector, amplifier, and ave tube. Outline 13A, OUTLINES SECTION. Tube requires lock-in Characteristics and maximum ratings of triode unit as class A1 amplifier: plate volts, 250 (300 max); grid volts, -1 (positive-bias value, 0 max); socket. Heater volts (ac/dc), 6.3; amperes, 0.15. plate ma., 1.3; amplification factor, 100; plate

For diode operation curves and triode application, refer to miniature type 6AV6. Type 7C6 is used resistance (approx.), 0.1 megohm; transconductance, 1000 µmhos; peak heater-cathode voits, 90 maz. principally for renewal purposes.

TION. Tube requires lock-in socket. Heater volts (ac/dc), 6.3; amperes, 0.15. Characteristics Glass lock-in type used as biased detector orrfamplifier. Outline 13A, OUTLINES SECand maximum ratings as class A1 amplifier: plate volts, 250 (300 max); grid-No.2 supply volts, 300 max; grid-No.2 volts, 100 max; grid-

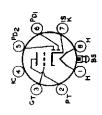
sipation, 1 max watt; plate resistance (approx.), 2 megohms; plate ma., 2; grid-No.2 ma., 0.5; trans-conductance, 1300 mmbos; peak heater-cathode volts, 90 max. This type is used principally for renewal purposes.



No.1 volts, -3 (positive-bias value, 0 maz); grid
No.3 and internal shield connected to cathode at socket; grid-No.2 input, 0.1 max watt; plate dis-

TWIN DIODE-MEDIUM-MU TRIODE

tector, amplifier, and ave tube. Outline 13A, OUTLINES SECTION. Tube requires look-in socket, Heater volts (ac/dc), 6.3; amperes 0.3. For maximum ratings, typical operation, and curves, refer to miniature type 6BF6. Type 7E6 is a DISCONTINUED type listed for reference Glass lock-in type used as combined de-



TWIN DIODE-REMOTE-CUTOFF PENTODE

Glass lock-in type used as combined detector, amplifier, and ave tube. Outline 18A, OUTLINES SECTION. Tube requires lock-in socket, Heater volts (ac/dc), 6.3; amperes, 0.3. tode unit as class A1 amplifier: plate volts, 250 (300 max); grid-No.2 supply volts, 300 max; Characteristics and maximum ratings of pen-

grid-No.2 volts, 100 maz; grid-No.1 volts, -3 (positive-bias value, 0 max); plate dissipation, 2 max watts; grid-No.2 input, 0.3 max watt; cathode-

bias resistor, 330 ohms; plato resistance (approx.), 0.7 megohm: transconductance, 1300 µmhos; plate ma., 7.5; grid-No.2 ma., 1.6; peak heater-cathode volts, 90 mar. For diode curves, refer to type 6AV6. Type TET is used principally for renewal purposes.

BEAM POWER TUBE

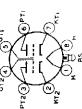
Related type: **6EY6**

deflection amplifier in television reheaterstrings.Outline14E,OUTLINES Glass octal type used as vertical ceivers employing series-connected SECTION. Tube requires octal socket

and may be operated in any position. Heater volts (ac/dc), 7.2; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with glass octal type 6EY6.

Glass lock-in type used as phase inverter or resistance-coupled amplifier. Outline 134, OUT-LINES SECTION. Tube requires lock-in socket, Heaver volts (ac/dc), 6.3; amperes, 0.3. For maximum ratings, typical operation as class A: amplifier, and curves, refer to glass-octul type 6SL7-GT. Type 7F7 is used principally for renewal purposes,

HIGH-MU TWIN TRIODE



= Technical Data =

5

MEDIUM-MU TWIN TRIODE

lator in radio equipment, Outline 13A, OUT-LINES SECTION, except over-all length is 2-9/32 max inches and seated length is 1-3/4 inches, Tube requires lock-in socket, Heater volts (ac/dc), 6.3; amperes, 0.3. Characteristics and maximum ratings as class A1 amplifier (each Glass lock-in type used as amplifier or oscil-

unit): plate supply volts, 250 (300 max); grid unit): plate supply volts, 250 (300 max); grid volts, positive-bias value, 0 max; plate dissipation, 3.5 max watts (both units, 3.5 max watts); cathode bias resistor, 500 ohms; plate ma., 6.0; transconductance, 3300 mmbs; amplification factor, 48; peak heater-cathode volts, 90 max. This type is used principally for renewal purposes.

SHARP-CUTOFF PENTODE

requiring high transconductance. Outline 13A, OUTLINES SECTION. Tube requires lock-in Glass lock-in type used in video amplifiers of television receivers and in other applications socket. Heater volts (ac/dc), 6.3; amperes, 0.45. Characteristics and maximum ratings as class At amplifier: plate volts, 250 (300 max); grid-No.2supply volts, 300 max;grid-No.2 volts,

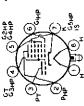
100 mar; plate dissipation, 1.5 mar watts; grid-No.2 input, 0.3 mar watt; grid-No.1 volts, -2; grid No.3 and internal shield connected to cathode at socket; plate resistance (approx.), 0.8 megohm; transconductance, 4500 µmhos; plate ma, 6; grid-No.2 ma, 2.0; peak heater-cathode volts, 90 mar. This type is used principally for renewal purposes.



SEMIREMOTE-CUTOFF PENTODE

Heater volts (ac/dc), 6.3; amperes, 0.3, Charplifier: plate volts, 250 (300 max); grid-No.2 in radio receivers. Outline 13A, OUTLINES supply volts, 300 max; grid-No.2 volts, 150 (see Glass lock-in type used as rf or if amplifier Tube requires lock-in socket, acteristics and maximum ratings as class A₁ am-SECTION.

eurve page 70); grid-No.1 volts, positive-bias valtages up to 150 volts, ordanz value, 0 maz; plate dissipation, 2.5 max watts; grid-No.2 input for grid-No.2 voltages up to 150 volts, 0.5 max watt (for grid-No.2 voltages between 150 and 300 volts, see curve page 70); grid No.3 and internal shield connected to cathode at socket; cathode-bias resistor, 180 ohms; plate resistance (approx.), 0.8 megohm; transconductance, 4000 µmhos; plate ma., 10; grid-No.2 ma., 3.2; peak heater-cathode volta, 90 max. This type is used principally for renewal purposes.



TRIODE—HEPTODE CONVERTER

tator and heptode mixer in radio receivers. Out-line 13A, OUTLINESSECTION. Tube requires Glass lock-in type used as combined oscillock-in socket. Heater volts (ac/dc), 6.3; amperes, 0.3. For maximum ratings and typical operation, refer to glass-octal type 6J8-G. Type 737 is used principally for renewal purposes.



TWIN DIODE—HIGH-MIJ TRIODE KD15.02

Glass lock in type used as FM detector and audio amplifier in circuit; which in require diode and triode units with separate cathodes. Outline 13A, OUTLINES SECTION Tuberequires lock-0.3. For ratings and typical operation, refer to glass-octal type 6AQ7-GT. Type 7K7 is used in socket. Heater volts (ac/dc), 6.3; amperes

principally for renewal purposes.

717

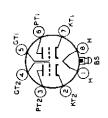
fer in radio equipment. Outline 13A, OUTLINES Glass lock-in type used as rf and if ampli-

SHARP-CUTOFF PENTODE

operation as clars..., see the state of the SECTION. Tube requires lock-in socket. Heater volts (ac/dc), 6.3; amperes, 6.3. Typical

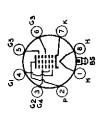
MEDIUM-MU TWIN TRIODE

or phase inverter in radio equipment. Outline 13B, OUTLINESSECTION Tuberequireslockapplication of this type is similar to that of glass-octal type 6SN7-GT. Type 7N7 is used Glass lock-in type used as voltage amplifier For maximum ratings and typical operation of each triode unit, refer to metal type 6J5. The in socket. Heater volts (ac/dc), 6.3; amperes, principally for renewal purposes.



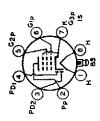
PENTAGRID CONVERTER

LINES SECTION, Tube requires lock-in socket. Heater volts (ac/dc), 6.3; amperes, 0.3 For Glass lock-in type used as converter in superheterodyne circuits. Outline 13A, OUTmaximum ratings, typical operation in converter service, and curves, refer to metal type 6SA7. Type 7Q7 is used principally for renewal purposes.



REMOTE-CUTOFF PENTODE TWIN DIODE

unit as class A: amplifier: plate volts, 250 max; grid-No.2 supply volts, 250 max; grid-No.2 volts, LINES SECTION, Tube requires lock-in socket. Heater volts (ac/dc), 6.3; amperes, 0.3, Characteristics and maximum ratings of pentode .00 (see curve page 70); grid-No.1 volts, -1 (pos-Glass lock-in type used as combined detector, amplifier, and ave tube. Outline 13A, OUT-



itive-bias value, 0 max); plate dissipation, 2 max watts; grid-No.2 input for grid-No.2 voltages up to 125, 0.25 max watt (for grid-No.2 voltages between 125 and 250 volts, see curve page 70); plate resistance (approx.), 1.0 megolini; transconductance, 3200 minos; plate ma., 5.7; grid-No.2 ma., 2.1; peak beate-cathode volts, 90 maz. Refer to type 6AV6 for diode curves. Type 7R7 is used principally for renewal purposes.

TRIODE -- HEPTODE CONVERTER

Glass lock-in type used as combined triode oscillator and heptode mixer, in radio receivers. Outline 13A, OUTLINES SECTION. Tube replate volts, 250 (300 maz); grids-No.2-and-No.4 volts, 100; grid-No.1 volts, -2; plate resistance, 1.25 megohms; conversion transconductance, quires lock-in socket. Heater volts (ac/dc), 6.3; amperes, 0.3. Typical operation of heptode unit:

volts, 250 (300 max) applied through a 20000-ohm dropping resistor bypassed by a 0.1-of capacitor; grid resistor, 50000 ohms; plate ma., 5.0; total cathode ma. (both units), 10.2. This is a DISCONTINUED type listed for reference only. 525 umhos; plate ma., 1.8; grids-No.2-and-No.4 ma., 3.0. Typical operation of triode unit: plate supply

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= Technical Data =



SHARP-CUTOFF PENTODE

Glass lock-in type used as rf or if amplifier in radoreceivers, Outline 13A, OUTLINESSEC. TION. Tube requires lock-in socker. Heater yolts (ac/dc), 6.3; amperes, 0.45. Characteris-

ties and maximum ratings as class A amplifier:

plate and grid-No.2 supply volts, 300 mar; grid-hold pation, 4 max watts; grid-No.2 input, 0.8 max watt; grid-No.2 input, 0.8 max watt; grid-No.2 input, 0.8 max watt; grid-No.2 input, 0.8 max max prox.), 0.3 megohm; transconductance, 5800 mm hos; plate max, 10; grid-No.2 max, 3.9; peak heater-cathode volts, 90 max. This type is used principally for renewal purposes.

SHARP-CUTOFF PENTODE

Glass lock-in type used as rf or if amplifier inradoreceivers. Juthin 13A, OUTLIN ESSECTION. The requires lock-in socket. Heater volts (ac'de), 6.3; amperes, 0.45. This type is the same as type TV7 except for socket connections. Type TW7 is used principally for renewal purposes.

TWIN DIODE—HIGH-MU TRIODE

Glass lock-in type used as combined detector, amplifier, and ave tube in circuits which required diodes with separate cathodes. Outline 13B. OUTLINESSECTION. Tube requires lock in socket. Hearer volts (ac/do), 6.3 amperes, o.3. Characteristics and maximum ratings of triode unit as class A₁ amplifier: plate volts, 250 (300 max); grid volts, 1; amplification facels to 1100; plate resistance (approx.), 67000 ohms; transconductance, 1500 µmhys; plate ma., 1.9; peak heater-cathode volts, 90 max. This type is used

principally for renewal purposes.

FULL-WAVE VACUUM RECTIFIER

automobile radio receivers and compact acopeated receivers. Outline 133, OUTLINES SECTION. Tube requires lock-insocket. Heater volts. (ac/de), 6.3; amperes, 0.5. Maximum ratings; peak inverse plate volts, 1250; peak plate ma. per plate, 180; de output ma., 70; peak heater-calhode volts, 460. For typical operation, refer to minjature type 6X4. Type 774 Glass lock-in type used in power supply of is used principally for renewal purposes.

FULL-WAVE VACUUM RECTIFIER

automobile and acoperated radio receivers.

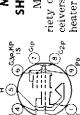
Outline 18B. OUTLINES SECTION. Tube requires lock-in socket. Heater volts (ac/de), 6.3;

appeares, 0.3. Maximum ratings: peak miverse plate volts, 1250; peak plate ma. per plate, 300; de output ma., 100; peak heater-cathode volts, 460. Typical operation with capacitor-input file.

10. Typical operation with capacitor-input file.

10. Typical operation with capacitor-input filer; ac plate-to-plate supply volts (rms), 550; choice-input filer; ac plate-to-plate supply volts (rms), 900; filter-input choke, 6 min henries, de output ma., 100. Typical operation with choice-input size is used principally for renewal purposes. Glass lock-in type used in power supply of

8AU8 SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-



Miniature type used in a wide vaceivers employing series-connected riety of applications in television reheater strings. The pentode unit is used as a video amplifier, an if amplifier, or

Related type: **6AUBA**

an agc amplifier. The triode unit is used in sync-amplifier, sync-separator, synccipper, and phase-inverter circuits. Outline 8D, OUTLINES SECTION. Heater volts (ac/dc), 8.4; amperes, 0.45. Except for heater ratings, this type is identical with type 6AUS.

HIGH-MU TRIODE—SHARP-CUTOFF PENTODE

8AW8A

Related type:

Miniature type used in a wide variety of applications in television receivers employing series-connected heater strings. The pentode unit is used as an amplifier and the triode

used as an ampinier and the choice unit is used in low-frequency oscillator or sync circuits. Outline 8D, OUTLINES SECTION. Heater volts (ac/dc), 8.4; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type

TWIN DIODE— MEDIUM-MU TWIN TRIODE

Duodecar type used as combined horizontal-deflection oscillator and horizontal phase detector in television receivers employing series-connected heater strings. Outline 12A, OUT-

Related type:

6810

9. s

LINES SECTION. Heater volts (ac/dc), 8.5; amperes, 6.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with duodecar type 6B10.

MEDIUM-MU TRIODE—SHARP-CUTOFF PENTODE

8BA8A Redectives

Miniature type used in a wide variety of applications in color and blackand-white television receivers employing series-connected heater strings. The pentode unit is used as a video ampli-

fier, an agc amplifier, or a reactance tube. The triode unit is used in low-frequency oscillator and phase-splitter circuits. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be operated in any position. Heater volts (ac/dc), 8.4; amperes, 0.45. Except for heater ratings, this type is identical with miniature type 6BA8-A.

MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE

SBLS Reletative:

Miniature type used in a wide variety of applications in television receivers employing series-connected of heater strings. The pentode unit is used as an if amplifier, a video amplifier, or seconds.

an age amplifier. The triode unit is used in low-frequency oscillator circuits. Outline 8D, OUTLINES SECTION. Heater volts (ac/dc), 8.4; amperes, 0.45. Except for heater ratings, this type is identical with type 6BH8.

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TWIN DIODE-HIGH-MU TRIODE

Miniature type used in a wide variety of applications in color and blackand-white television receivers employing series-connected heater strings. The

8BN8 Related type: af amplifier, and low-frequency oscillator applications. The diode units are used in phase-detector, ratio-detector or discriminator, and horizontal AFC discriminator circuits. Outline 8D, OUTLINES SECTION. Heater volts (ac/dc), 8.4; amperes, 0.45. Except for heater ratings, this type is identical with type 6BN8.



POWER PENTODE

Miniature type used in the output stage of audio-frequency amplifiers employing series-connected heater strings Outline 8E, OUTLINES SEC-TION. Heater volts (ac/dc), 8; am-

Related type:

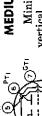
(UT) strings Outline 8E, OUTLINES SEC
of TION. Heater volts (ac/dc), 8; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type

MEDIUM-MU TWIN TRIODE

is identical with type 6BQ5.

Miniature type used as combined vertical deflection and horizontal deflection oscillator in television receivers employing series-connected heater strings. Outline 8D, OUTLINES SEC-

Related type: 6CG7 TION. Heater volts (ac/dc), 8.4; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6CG7.



MEDIUM-MU DUAL TRIODE

Miniature type used as combined vertical oscillator and vertical deflection amplifier in television receivers employing series-connected heater strings. Outline 8D, OUTLINES SEC-

8CM7

Prof. Mrs. strings. Outline 8D, OUTLINES SEC.
TION. Heater volts (ac/dc), 8.4; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6CM7.



TWIN DIODE—HIGH-MU TRIODE

Miniature type used as combined horizontal phase detector and reactance tube in television receivers employing series-connected heater strings. The triode unit is used in sync-

Related type: 6CN7 separator, sync-amplifier, or audio-amplifier circuits. Outline 8B, OUTLINES SECTION. Heater volts (ac/dc), 8.4 (series), 4.2 (parallel); amperes, 0.225 (series), 0.45 (parallel); warm-up time (average), 11 seconds (parallel). Except for heater ratings, this type is identical with type 6CN7.

Related type: 6CS7

cal-deflection amplifier in television reheater strings. Outline 8D, OUTLINES Miniature type used as combined vertical-deflection oscillator and verticeivers employing series-connected

SECTION. Heater volts (ac/dc), 8.4; amperes, 0.45; heater warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with type 6CS7.

watts page 70 watts

1.1 max See curve 1

5 max

330 max 330 max

Grid-No.2 (screen-grid) Supply Voltage. Grid-No.2 Voltage. GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value. GRID-NO.2 INPUT: For grid-No.2 voltages up to 165 volts. For grid-No.2 voltages between 165 and 330 volts.

Maximum Ratings, (Design-Maximum Values):

PENTODE UNIT AS CLASS A: AMPLIFIER

= Technical Data =

volts volts

200 max 200°max

PRIK HEATER-CATHODE VOLTACE: Heater negative with respect to cathode. Heater positive with respect to cathode.

PLATE DISSIPATION.

volts volts volts ohms chms mmhos ma

 $\begin{array}{c} 200 \\ 200 \\ 150 \\ - \\ 100 \\ 60000 \\ 11500 \\ 25 \\ 5.5 \\ -10 \end{array}$

Transconductance (Approx.). Plate Current. Grid-No.2 Current. Plate Current Grid-No.2 Current Grid-No.1 Voltage (Approx.) for place current of 100 µa

Piate Supply Voltage Grid-No.2 Supply Voltage Grid-No.1 Voltage Carhode-Bias Resistor

megohm megohm

0.1 max 0.25 max

Grid-No.1-Circuit Resistance For fixed-bias operation For cathode-bias operation

Maximum Circuit Values:

DIODE UNITS

volts volts

200 max 200 max

Heater negative with respect to cathode... Heater positive with respect to cathode.

DC PLATE CURRENT. PEAK HEATER-CATHODE VOLTAGE:

Maximum Ratings, (Design-Maximum Values):

voits

10

ma

3 max

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-

Related type:

video amplifier; triode unit is used in Miniature type used in television heater strings. Pentode unit is used as receivers employing series-connected sound if amplifier, sweep-oscillator,

sync-separator, sync-amplifier, and sync-clipper circuits. Outline 8D, OUTLINES SECTION. Heater volts (ac/dc), 8; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with type 6CX8.

SHARP-CUTOFF PENTODE HIGH-MU TRIODE-

Miniature type used in color and black-and-white television receivers employing series - connected heater strings. The pentode unit is used as a video output amplifier; the triode unit

Related lype:

6EBB

OUTLINES SECTION. Heater volts (ac/dc), 8; amperes, 0.6; warm-up time is used in sync-separator, sync-clipper, and phase-inverter circuits. Outline 8D, (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6EB8.

BEAM POWER TUBE

8EM5 Related type:

ceivers utilizing picture tubes having Miniature type used as vertical deflection amplifier in television rediagonal deflection angles of 110 degrees and employing series-connected

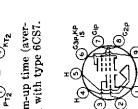
heater strings. Outline 8E, OUTLINES SECTION. Heater volts (ac/dc), 8.4; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6EM5.

SHARP-CUTOFF PENTODE TWIN DIODE-

<u></u>

SO 8 02 Kp. 8 02 receivers employing series-connected used as a video amplifier and the diodes Miniature type used in television heater strings. The pentode unit is

socket and may be operated in any position. Heater volts (ac/dc), 8; amperes, 0.6; verter. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact are used as a horizontal phase inwarm-up time (average), 11 seconds.



Characteristics

MEDIUM-MU TWIN TRIODE

■ This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

Tube Voltage Drop for plate current of 1.5 ma.

O The dc component must not exceed 100 volts. Characteristics, Instantaneous Value:

Miniature type used as combined cillator in television receivers employvertical- and horizontal-deflection osing series-connected heater strings. **№** KT1

© Š

Tube requires miniature nine-contact socket and may be operated in any position. Outline 8D, OUTLINES SECTION.

Heater volts (ac/dc), 8.4; amperes, 0.45. Except for heater ratings, the 8FQ7 is

identical with type 6FQ7.

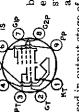


SHARP-CUTOFF PENTODE HIGH-MU TRIODE—

Miniature type used in color and black-and-white television receivers amplifier applications; pentode unit is employing series-connected heater strings. Triode unit is used in voltage-

8C\08 6GN8, 10GN8 Related Pypes:

used in output stage of video amplifier. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be operated in any position. Heater volts (ac/dc), 8; amperes, 0.6; heater warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with type 6GN8.



SHARP-CUTOFF PENTODE HIGH-MU TRIODE—

Miniature type used in a wide variety of applications in television receivers, particularly those having lowvoltage "B" supplies and employing series-connected heater strings. The

Related type:

6/4



warm-up time (average), 11 seconds. Except for heater ratings, this type is identisuppression circuits. The pentode unit is especially useful as a video amplifier tube. riode unit is used in sound-if, keyed-agc, sync-separator, sync-amplifier, and noise-Outline 8D, OUTLINES SECTION. Heater volts (ac/dc), 8.5; amperes, 0.45; cal with miniature type 6JV8.

SHARP-CUTOFF PENTODE HIGH-MU TRIODE—

Related type: 6KA8

Miniature type used in color and employing series-connected heater strings. The triode unit is used in syncseparator circuits; the pentode unit black-and-white television receivers

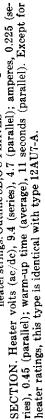
amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this has two independent control grids and is used in gated-agc-amplifier and noiseinverter circuits. Outline 8D, OUTLINES SECTION. Heater volts (ac/dc), 8.4; HT2(4) type is identical with miniature type 6KA8.

MEDIUM-MU TWIN TRIODE

Miniature type used as combined KT2(3) tical-deflection-oscillator in television vertical-deflection-amplifier and verheater strings. Outline 8B,OUTLINES receivers employing series-connected

9AU7

7AU7, 12AU7A Related types:



TWIN DIODE—HIGH-MU TRIODE

Miniature type used as combined sync separator and horizontal phase detector in telesocket. Heater volts (ac/dc), 9.4 (series), 4.7 (parallel); amperes, 0.3 (series), 0.6 (parallel); warm-up time (average), 11 seconds. Characvision receivers employing series-connected heater strings. Outline 8B, OUTLINES SEC-TION. Tube requires miniature nine-contact teristics of triode unit as class A1 amplifier:

sistance (approx.), 10900 ohms; transconductance, 4000 µmhos; plate ma., 10; plate dissipation, 2.5 mar watta. Maximum ratings of diode unit: peak inverse plate volis, 300 mor; peak plate ma., 60 mar. Peak heater-cathode volts: heater negative with respect to cathode, 300 mor; heater positive with replate supply volts, 250 (300 maz); cathode-bias resister, 200 ohms; amplification factor, 60; plate respect to cathode, 200 maz (the de component must not exceed 100 volts). This type is used principally for renewal purposes.

SHARP-CUTOFF TETRODE MEDIUM-MU TRIODE-

Miniature type used as combined television receivers employing series-OUTLINESSECTION. Tuberequires oscillator and mixer in vhf tuners of connected heater strings. Outline 8B,

miniature nine-contact socket and may be mounted in any position. Heater volts ્ર Fi (ac/dc), 9.5; amperes, 0.3; warm-up time (average), 11 seconds.

368

= Technical Data

	Triode Unit Tetrode Unit	300 max	300 max	Bee curve	The control of	0.5 max
	Triode Unit	300 max	ı	0	7000	ı
CLASS A, AMPLIFIER	Maximum Ratings, (Design-Center Values):	PLATE VOLTAGE	GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE	CRID-NO.2 VOCTAGE	GRID-NO.1 (CONTROL-GRID) VOLIAGE, FOSIGIVE-DIAS VAIGE	Don said My 9 waltages on to 150 walte

Heater negative with respect to cathode.

Heater positive with respect to cathode. The dc component must not exceed 100 volts. PLATE DISSIPATION.

PEAK HEATER-CATHODE VOLTAGE:

page 70 watte volts volts

200 max 200 max

200 max 200 max

2.7 max

see curve page

0 max 0.5 max 2.8 max volts volts volt obms

ohms

mpoe n

126	126 _1	100001	12	-10	e 0.25 max r 1 max
125	1 1 5	2000 2000	15	ရ	0,5 max 1 max
Characteristics Dieto Sunnistics	Grid-No.2 Supply Voltage Grid-No.1 Voltage	Cathode-Bias Resistor Amplification Factor. Plate Resistance (Approx.)	Transconductance	Grid-No.2 Current. Grid-No.1 Voltage (Approx.) for plate current of 10 μ a	Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-biss operation. For exthode-biss operation

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

megohm megohm

Miniature type used in television bined oscillator and mixer tube in vhf receivers employing series-connected heater strings. Tube is used as comtuners of television receivers utilizing KP G3p **®**

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₹

908A Related types: SUB, 6UBA

OUTLINES SECTION. Heater voltage (ac/dc), 9.45; amperes, 0.3, warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with an intermediate frequency in the order of 40 megacycles per second. Outline 8B, type 6U8-A

POWER TRIODE



Tube requires four-contact socket. Filament volts (ac/dc), 7.5; amperes, 1.25. Typical operation as class A: af power amplifier: plate volts, plate ma., 18; plate resistance, 5000 ohms; Glass type used as an audio-frequency amplifier. Outline 28, OUTLINES SECTION. 425 max; grid volts, -40; peak af grid volts, 35; transconductance, 1600 µmhos; load resistance

0

10200 ohms; undistorted output watts, 1.6. This is a DISCONTINUED type listed for reference only.

HIGH-MU TRIODE-

connected heater strings. The pentode unit is used as a general-purpose amplifier tube; the Miniature type used in diversified applitriode unit is used in vertical-deflection-oscillator, sync-separator, sync-clipper, and syncamplifier circuits. Outline 8B, OUTLINES SECcations in television receivers employing series-

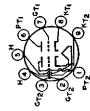
warm-up time (average), 11 seconds. Characteristics of triode unit as class A1 amplifier: plate supply volts, 250 (300 max); cathode-bias resistor, 390 ohms; amplification factor, 53; plate resistance (ap-TION. Tube requires miniature nine-contact socket. Heater volts (ac/dc), 10.5; amperes, 0.3;



DUAL TRIODE

ODE7 Related types: 6DE7, 13DE7

Miniature type used as combined flection amplifier in television receivers employing series-connected heater vertical oscillator and vertical destrings. Unit No.1 is a medium-mu



age), 11 seconds. Except for heater ratings, this type is identical with miniature triode unit used as a blockin $ar{ ext{a}}$ oscillator in vertical-deflection circuits, and unit No.2 is a low-mu triode unit used as a vertical-deflection amplifier. Outline 8D, OUT-LINES SECTION. Heater volts (ac/dc), 9.7; amperes, 0.6; warm-up time (avertype 6DE7

DUAL TRIODE

IODR7 Related type: **6DR7, 13DR7**

9. tical-deflection-amplifier tube in tele-Miniature type used as combined vision receivers employing series-connected heater strings. Outline 8D, vertical-deflection-oscillator and ver-

OUTLINES SECTION. Tube requires miniature nine-contact socket and may be operated in any position. Heater volts (ac/dc), 9.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, the 10DR7 is identical with type

SHARP-CUTOFF PENTODE HIGH-MU TRIODE—

ODX8

receiver applications. The triode unit is used as a sync-separator, sync-amplifier, keyed-agc, or noise-suppressor tube. The pentode unit is used as a Miniature type used in television-

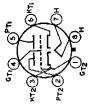
amperes, 0.45. Except for heater ratings, this type is identical with miniature type video output tube. Outline 8D, O $\check{ extsf{T}}$ TLINES SECTION. Heater volts (a $e/ ext{dc}$), 10.2;

DUAL TRIODE

Glass octal type used as combined tical-deflection amplifier in television heater strings. Outline 19, OUTLINES vertical-deflection oscillator and verreceivers employing series-connected

SECTION. Tube requires octal socket and may be operated in any position. Heater volts (ac/dc), 9.7; amperes, 0.6; warm-up time (average), 11 seconds. For maximum ratings and characteristics, refer to type 6EW7.

= Technical Data



DUAL TRIODE

Glass octal type containing highmu triode and high-perveance, low-mu triode in same envelope. Used as combined vertical-deflection oscillator and vertical-deflection amplifier in televi-

6EM7, 13EM7 **10EM**; Related types:

sion receivers employing series-connected heater strings. Outline 14A, OUTLINES SECTION. Heater volts (ac/dc), 9.7; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with type 6EM7

DUAL TRIODE

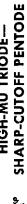
and high-perveance, low-mu triode units used as combined vertical-deflection amplifier and vertical-deflection Novar type containing high-mu oscillator in television receivers em-

10GF7

Related types: 6GF7, 13GF7

SECTION. Heater volts (ac/dc), 9.7; amperes, 0.6; warm-up time (average), 11 seconds. ploying series-connected heater strings. Outline 10A, OUTLINES Except for heater ratings, this type is identical with novar type 6GF7.

HIGH-MU TRIODE-



Miniature type used in color and black-and-white television receivers strings. The triode unit is used as a employing series-connected heater

<u>8000</u>

Related types:

verter, or sound-if-amplifier tube. The pentode unit is used in the output stage of video amplifiers. Outline 8D, OUTLINES SECTION. Heater volts (ac/dc), 10.5; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this 6GN8, BGN8 sync-separator, sync-clipper, phase-intype is identical with miniature type 6GN8.

HIGH-MU TRIODE—



Miniature type used in color and black-and-white television receivers strings. Triode unit is used in high-gain, employing series-connected

OHF8

Related type:

sync-clipper, and phase-inverter circuits; pentode unit is used as video-output amplifier. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be operated in any position. Heater volts (ac/dc), 10.5; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this sound-if stages and in sync-separator,

SHARP-CUTOFF TETRODE HIGH-MU TRIODE-

type is identical with miniature type 6HF8.

black-and-white television receivers strings. The triode unit is used as a Miniature type used in color and employing series-connected heater

inverter; the tetrode unit is used as a video amplifier. Outline 8D, OUTLINES sync separator, sync clipper, and phase

seconds

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黑		
AP.E		
∀ ₹		
CLASS A, AMPLIFIER		Values):
		faximum
		we Ratinas. (Design-Maximum Values):
		Ratinas.
		Ę

Tetrode Unit

rode

Maximum Ratings. (Design-Maximum Values):	:(8)		Unit	Unit	
Dr. and Voter on			300 max	330 max	volts
CRID-NO 2 (RURERN-CRID) SUPRLY VOLTAGE.			1	330 max	volts
CRID-No.2 Voltage.			1 •	See curve page 70	oage (U
GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	ve-bias value		0 max	0 222	VOIDS
PLATE DISSIPATION			1 max	e mer	Marks
GRID-NO.2 INPUT:				100	******
For grid-No.2 voltages up to 165 volts			ı	T. O. Wells	100
For grid-No.2 voltages between 165 and 330 volts	1 330 volts			see carve page 10	bage 10
PEAK HEATER-CATHODE VOLTAGE:					4
Heater negative with respect to cathode	e		200 max	200 max	VOLUS TO I
Heater positive with respect to cathode			200 - max	Z00-max	40118
Characteristics:	Triode Unit		Tetrode Unit	;	:
Plate Voltage	135 200	30	135	200	volts
ALL No 9 Voltage	ı	135	135	132	VOLUS
Grid-No. 1 Wolfson	-2	0	10	-1.5	volts
CLICATION A DICARCO	102	. 1	. 1	ı	

Grid-No.2 Voltage Grid-No.1 Voltage Grid-No.1 Voltage Amplification Factor Place Resistance Plate Current Grid-No.2 Current Grid-No.2 Current Grid-No.1 Voltage (Approx.) for plate current of 10 µa.	23000 28000 2600 2 2 -	-2 70 70 4000 4 -	135 0 0 14.	135 0 -1.5 - 6600 - 12600 32* 4.2 17	100 7000 14000 4	
Maximum Circuit Values: Grid-No.1-Gircuit Resistance: For fixed-bias operation				Triode Unit 0.5 max 1 max	Tetrode Unit 0.25 max 1 max	H H

obros

#mhos

ma volts megohm

The dc component must not exceed 100 voits. Grid-No.1-Circuit Resistance: For fixed-bias operation..... For cathode-bias operation...

This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

DETECTOR AMPLIFIER

Glass type used as detector and amplifier in battery-operated receivers. Filament volts (dc), 1.1; amperes, 0.25. Typical operation as ohms; transconductance, 440 µmhos; plate ma., 3. This is a DISCONTINUED type listed for class A1 amplifier: plate voits, 135 max; grid volts, -10.5; plate resistance (approx.), 15500 reference only.

SEMIREMOTE-CUTOFF TWIN PENTODE

6P2

IIARII Related type: 6AR11

Duodecar type used as if-ampliing series-connected heater strings. Heater volts (ac/dc), 11.2; amperes, fier tube in television receivers employ-Outline 12A, OUTLINES SECTION

identical with duodecar type 6AR11.

0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is

DUAL TRIODE

Miniature type used in television receivers employing series-connected heater-strings. Low-mu triode unit is used as vertical-deflection amplifier; high-mu triode unit is used as vertical-

deflection oscillator. Outline 8D, OUTLINES SECTION. Heater volts (ac/dc), 11; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater rating, this type is identical with miniature type 6CY7.

0,7€

® KT2

= Technical Data

SHARP-CUTOFF PENTODE HIGH-MU TRIODE-

Miniature type with frame-grid pentode unit used in black-and-white television receivers. The triode unit is used in general-purpose voltage-am-

plifier, sync-separator, and sound-if-

OUTLINES SECTION. Heater volts (ac/dc), 10.9; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniaamplifier applications. The pentode unit is used as a video output tube. Outline 8D, ture type 6KV8.

DETECTOR AMPLIFIER

Class type used as detector and amplifier in battery-operated receivers. Filament volts (dc), 1.1; amperes, 0.25. Typical operation as class A, amplifier: plate volts, 135 max; grid volts, -10.5; plate resistance (approx.), 15500 ohms; transconductance, 440 µmhos; plate ma, 3. This is a DISCONTINUED type listed for reference only.

2

POWER PENTODE

Glass type used as output amplifier in ac /dc radio receivers. Maximum dimensions: over-all length, 4-3/16 inches; seated height, 3-9/16 inches; diameter, 1-9/16 inches. Heater volts (ac/dc), 12.6 (series), 6.3 (parallel); amperes, 0.3 (series), 0.6 (parallel). Typical operation as class A, amplifier: plate volts and grid-No.2 volts, 180 max; grid-No.1 volts, -25; plate ma,

H 45; grid-No.2 ma., 8; plate resistance, 35000 ohrns; transconductance, 2400 µmhos; load resistance, 3300 ohrns; output watts, 3.4. This is a DIS-CONTINUED type listed for reference only.

RECTIFIER -- POWER PENTODE

Glass type used as combined half-wave rectifier and power amplifier. Outline 24B, OUT-LINES SECTION. Tube requires small sevencontact (0.75-inch, pin-circle diameter) socket. Heater volts (ac/dc), 12.6; amperes, 0.3. Typical operation of pentode unit as class A₁ ampligrid-No.1 volts, -13.5; load resistance, 13500 fier: plate volts and grid-No.2 volts, 135 max;

ohms; plate resistance, 100000 ohms; transconductance, 975 µmhos; cathode-bias resistor, 1175 ohms; plate ma, 9; grid-No.2 ma, 2.5; output waits, 0.55. Maximum ratings of rectifier unit with capacitorinput filter: ac plate volts (rms), 125; de output ma, 30. This is a DISCONTINUED type listed for reference only.

PENTAGRID CONVERTER

Glass octal type used as converter in ac/dc receivers. Outline 15A, OUTLINES SECTION. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater rating, this type is identical with glass octal type 6A8-GT. Type 12A8-GT is used principally for renewal purposes.

BEAM POWER TUBE

put stage of automobile radio receivers tery. Outline 8D, OUTLINES SEC-Miniature type used in the outoperating from a 12-volt storage bat-TION. Tube requires miniature ninecontact socket and may be mounted in any position.



6KV8



= RCA Receiving Tube Manual =

volts ampere	ada .	o 14 volts.
10.0 to 15.9 0.2	0.7 max 8 8.5	agerange of 11 to
HEATER-VOLTAGE RANGE (AC/DC) 10.0 to 15.9 HEATER CURRENT (Approx.) at 12.6 volts 0.2 0.2	Direct Interd. Ectrode Capacitances: Grid No.1 to Place. Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3. Plate to Cathode, Heater, Grid No.2, and Grid No.3.	 For longest life, it is recommended that the heater be operated within the voltagerange of 11 to 14 volts.

CLASS A, AMPLIFIER

Values):	
(Design-Center	
Ratings,	
Aaximum	

volts volts watts	volta	္စ
315 max 285 max 12 max	20m 06	250 max
PLATE VOLTAGE. GRID-NO.2 (SCREBN-GRID) VOLTAGE. PLATE DISSIPATION.	GRID-NO.2 INPUT. PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode.	Heater positive with respect to eathodeBULB TEMPERATURE (At hottest point)

Typical Operation with 12.6 Volts on Heater:			
Date Complex Voltage	250	250	OA
Cata No 9 Spenier Coltage	200	250	vo
Crid-No.1 (Control-Grid) Voltage	1	-12.5	ο. ·
Cathode-Bias Resistor.	270	9	ohr
Peak AF Grid-No.1 Voltage	9.0	6 W	6
Zero-Signal Plate Current	99. D	<u> </u>	- 1
Maximum-Signal Plate Current.	9,	, w	. `
Zero-Signal Grid-No.2 Current		, ,	
Maximum-Signal Grid-No.2 Current	7500	20000	-do
Plate Resistance (Approx.)	0007	4100	i i
Transconductance	000	2000	o do
Load Resistance.	ac	36	ber ce
Maximum-Signal Power Output,	න න	4.6	MA

lits of the property of the pr

Maximum Circuit Values:

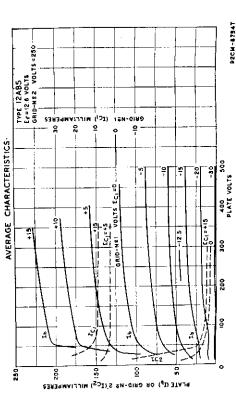
0.1 max	O. O TRUE
Grid-No.1-Circuit Resistance: For fixed-bias operation	For eathode-bias operation

megohm megohm

PUSH-PULL CLASS AB, AMPLIFIER

Maximum Ratings: (Same as for single-tube class A_t amplifier)

	250	250	QI-	000	25	5 11		13
Typical Operation with 12.6 Yolts on Heater (Values are for two tabes):	Diate Voltane	Grid-No.2 Voltage	Grid-No.1 Voltage	Peak AF Grid-No.1-to-Grid-No.1 Voltage	Zero-Signal Plate Current	Maximum-Signal Plate Current	Zero-Signal Grid-No.2 Current	Maximum-Signal Grid-No.2 Current



ohms per cent watts
10000 5 10
ctive Load Resistance (Plate-to-plate) al Harmonie Distortion dimum-Signal Power Output

= Technical Data ==

Maximum Circuit Values:

megohm megohm

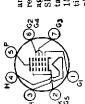
0.1 max 0.5 max

REMOTE-CUTOFF PENTODE

in automobile receivers operating from a 12-volt storage battery. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket. Heater-voltage range (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.15. Characteristics as class A; amplifier: heater volts, 12.6; plate and grid-No.2 volts, 12.6 (30 max); grid No.3 connected to cathode at socket; grid-No.1 volts, Miniature type used as rf and if amplifier

0; grid-No.1 resistor (bypassed), 2.2 megohms; plate resistance (approx.), 0.5 megohm; transconductance, 730 μ mhos; plate ma., 0.55; grid-No.2 ma., 0.2; cathode ma., 20 max; peak heater-cathode volts, 30 max. This type is used principally for renewal purposes.

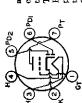
PENTAGRID CONVERTER



SECTION. Tube requires miniature seven-contact socket. Heater-voltage range (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.15. Typical opera-Miniature type used as combined oscillator and mixer in low B + voltage automobile radio receivers operating directly from a 12-volt storage-battery system. Outline 7B, OUTLINES tion in converter service; heater volts, 12.6;

grid-No.1 resistor, 33000 ohms; plate resistance (approx.), 0.4 megohm; conversion transconductance, 320 µmhos; plate ma., 0.35; grids-No.2 and-No.4 ma., 1.5; grid-No.1 ma., 0.06; total cathode ma., 1.6 (20 maz); peak heater-cathode volts, 16 max. This type is used principally for renewal purposes. maz); grid-No.3 volts, 0 max; grid-No.1 volts (peak-to-peak), 4.5; grid-No.3 resistor, 2.2 megohms; plate and grids-No.2-and-No.4 volts, 12.6 (16

MEDIUM-MU TRIODE TWIN DIODE-



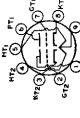
volts
volts
volts
ma
ma
ma

tery. Outline 7B, OUTLINES SECTION.
Tubes require miniature seven-contact socket.
Heater-voltage range (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.15 Characteristics of Miniature types used as combined detector triode unit as class A1 amplifier: heater volts, and af voltage amplifier in automobile radio receivers operating from a 12-volt storage bat-12.6; plate volts, 12.6 (30 max); grid volts, 0;

12AE6A **12AE6**

plate resistance (approx.), 13000 ohms; amplification factor, 16.7; transconductance, 1300 µmhos; plate ma., 1; total cathode ma., 20 max. Maximum diode plate ma. (each unit), 1 max. Peak heater-athode volts, 30 max. Type 12AE6 is a DISCONTINUED type listed for reference only. Type 12AE6-A is used principally for renewal purposes.

DUAL TRIODE



mu triode units used as transistor-driver in audio-output stage of bybrid car radios. Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket. Heater-voltage range (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.45. Characteristics as class A1 amplifier: Miniature type with medium-mu and lowheater volts, 12.6; plate volts, 12.6; grid resistor,

2); amplification factor, 13 (unit No.1), 6.4 (unit No.2); place resistance (approx.), 3150 ohms (unit No.1), 556 ohms (unit No.1), 556 ohms (unit No.2); place maa, 1.9 (unit No.4), 7.5 (unit No.2). Maximum ratings as audio driver (each unit); plate volts, 16 max; grid volts, 0 max; plate dissipation, 1 max watt; peak heater-cathode volts, 16 max. This type is used 1.5 megohms (unit No.1), 1 megohm (unit No. principally for renewal purposes.

HALF-WAVE VACUUM RECTIFIER

12AF3 Related type: 6AF3

ries-connected heater strings. Outline 9B, OUTLINES SECTION. Heater tube in horizontal-deflection circuits of television receivers employing se-Miniature type used as a damper

volts (ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6AF3.

REMOTE-CUTOFF PENTODE

in automobile radio receivers operating from a 12-volt storage battery. Outline 7B, OUT-LINES SECTION. Tube requires miniature seven-contact socket. Heater-voltage range volts, 12.6; plate and grid-No.2 volts, 12.6 (16 max); grid No.3 connected to cathode at socket; Miniature type used as if and rf amplifier (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.15. Characteristics as class A₁ amplifier: heater LINES

0.36 megohm, transconductance, 1500 μmhos; plate ma., 1.1; grid-No.2 ma., 0.45; peak heater-cathode volts, 16 max. This type is used principally for renewal purposes. grid-No.1 supply volts, 0 max; grid-No.1 resistor (bypassed), 2.2 megohms; plate resistance (approx.),

MEDIUM-MU TWIN TRIODE

inches and seated length is 2-1/2 inches. Tube Glass octal tube used as audio amplifier in radioequipment.Outline14B,OUTLINESSEC-TION, except over-all length is 3-1/16 max requires octal socket. Heater volts (ac/dc), 12.6; ratings (each unit) as class A1 amplifier: plate factor, 16; transconductance, 1900 µmhos; plate resistance (approx.), 8400 ohms; plate ma., 7.6. This type is used principally for renewal purposes. amperes, 0.15. Characteristics and maximum volts, 180 maz; grid volts, -6.5; amplification

HIGH-MU TRIODE TWIN DIODE-

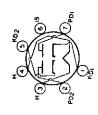
and at voltage amplifier in automobile radio receivers operating from a 12-volt storage battery. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket. Heatervoltage range (ac/dc), 10 to 15.9 volts; amperes at 12.6 volts, 0.15. Characteristics with heater volts of 12.6 and maximum ratings of triode Miniature type used as combined detector

unit as class At amplifier: plate volts, 12.6 (30 max); grid volts, 0; amplification factor, 55; plate resistance (approx.), 45000 ohms; transconductance, 1200 mmhos; plate ma., 0.75; total cathode ma., 20 mar; peak heater-cathode volts, 30 mar. Maximum rating of each diode unit; plate ma., 1 mar. This type is used principally for renewal purposes.

TWIN DIODE

0.15. Except for heater rating, this circuits. It is especially useful as a type is identical with miniature type Miniature, high-perveance type used as detector in FM and television Heater volts (ac/dc), 12.6; amperes, ratio detector in ac/de FM receivers. Outline 7A, OUTLINES SECTION

> Related types: 3ALS, 6ALS



MEDIUM-MU TRIODE-POWER TETRODE

tery. The triode unit performs the trigger function and the tetrode unit performs the relayactuating function in automatic station-selection circuits. Outline 8D, OUTLINES SEC-TION. Tube requires miniature nine-contact socket. Heater-voltage range (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.55. Characteristics Miniature type used in automobile-radio receivers operating from a 12-volt storage bat-

plate volts, 12.6 (30 max); grid-No.1 (space-charge-grid) volts, 12.6 (16 absolute max); grid-No.2 (contransconductance, 1000 µmhos; plate ma., 0.5; cathode ma., 20 maz. Tetrode unit: heater volts, 12.6; trol-grid) volts, (developed across 2.2-megohm resistor), -0.5 (-20 max); amplification factor (grid No.2 to plate), 7.2; plate resistance (approx.), 480 ohms; transconductance (grid No.2 to plate), 15000 mmhos; plate ma., 40; grid-No.1 ma., 75. Peak beater-cathode volts, 30 *max.* This type is used principally for of triode unit as class A1 amplifier: heater volts, 12.6; plate volts, 12.6 (30 max); grid volts (developed aeross 2.2-megohm resistor), -0.9; amplification factor, 13; plate resistance (approx.); 13000 ohms renewal purposes.

(0) 628 ➂

SHARP-CUTOFF PENTODE BEAM POWER TUBE-

Duodecar type used as FM detector and audio-frequency output amplifier in television receivers employing series-connected heater strings. Outline 12B, OUTLINES SECTION

6AL11

Heater volts (ac/dc), 12.6; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with duodecar type 6AL11.

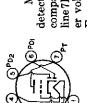


BEAM POWER TUBE

Miniature type used as output SECTION. Heater volts amplifier primarily in automobile radio receivers operating from a 12-volt storage battery. Outline 7C, OUT-LINES SECTION. Heater volts

5AQ5, 6AQ5A Related types:

(ac/dc), 12.6; amperes, 0.225. Except for heater ratings, this type is identical with miniature type 6AQ5. Within its maximum ratings, the performance of the 12AQ5 is equivalent to that of the larger type 12V6-GT.



HIGH-MU TRIODE TWIN DIODE

detector, amplifier, and ave tube in line 7B, OUTLINES SECTION. Heat-Except for heater ratings, this type is Miniature type used as combined compact ac/de radio receivers, Outer volts (ac/dc), 12.6; amperes, 0.15. identical with miniature type 6AT6.



HIGH-MU TWIN TRIODE

HT2

cathode-drive amplifier or frequency Miniature type used as push-pull converter in the FM and television broadcast bands. Outline 8B, OUT-

miniature nine-contact socket and may be mounted in any position. Each triode LINES SECTION. Tube requires

377

unit is independent of the other except for the common heater. For typical operation as a resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER SECTION.

Heaver Arrangement 12.6 6.3 volta Heaver Arrangement 12.6 6.3 ampere Heaver Voltagement 40.050 0.15 0.3 Direct Number 1.5 0.3 ampere Direct Number 1.5 0.3 ampere Grid-Drive Operation 1.5 pl Grid to Plate (Each unit) 2.2 pl Unit No.1 0.5 pl Unit No.2 0.4 pl Cathode-Drive Operation 0.2 pl Cathode to Grid and Heater (Each unit) 1.6 pl Cathode to Grid and Heater (Each unit) 1.6 pl Cathode to Grid and Heater (Each unit) 1.6 pl Cathode to Grid and Heater (Each unit) 1.6 pl Cathode to Grid and Heater (Each unit) 1.6 pl Heater to Cathode (Each unit) 1.6 pl		Contos	Parallel	
er (Each unit) 2.2 2.2 0.5 0.4 0.1 0.2 0.2 0.2 0.2 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	CAPACTANCES	12.6 0.15	80 CO	volts ampere
0.5 0.4 0.4 0.2 cer (Each unit) 1.8 (Each unit) 2.4	unit). Heater (Each unit).		25.2	īd
04-49 83-84	ater:		0.0 4.0	ងីដី
	ich unit) Heater (Each unit) auter (Each unit). unit)		0448 8.9.64	ESES

CLASS AL AMPLIFIER (Each Unit)

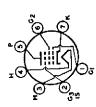
voits voits watts voits	volts ohms ohms unhos volts ma
300 max -50 max 2.5 max 90 max	250 200 200 60 10990 5500 -12 10
Maximum Ratings, (Design-Center Values): PLATE VOLTAGE GRID VOLTAGE, Negative-bias value. PLATE DISSIPATION PRAK HARTER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode.	Characteristics: 100 Plate Supply Voltage. 270 Cathode-Blas Resistor 60 Amplification Flates 1600 Plate Resistance (Approx.) 4000 Crid Voltage (Approx.) for plate current of 10 µs. -5 Plate Current. 3.7

؋ AVERAGE PLATE CHARACTERISTICS SERIES HEATER ARRANGEMENT E.F. = 12.4 VOLTS TYPE 12AT7

SHARP-CUTOFF PENTODE

92CM-70567

Miniature type used in compact LINES SECTION. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is identical with miniature type 6AU6. band applications. Outline 7B, OUTac/de radio equipment as an rf amplifier especially in high-frequency, wide-



= Technical Data =

MEDIUM-MU TWIN TRIODE

H72

oscillators in industrial control deverter or push-pull amplifier in ac/dc applications such as multivibrators or Miniature types used as phase inradio equipment and in diversified

小品

12AU7A Related types: 7AU7, 9AU7

position. Each triode unit is independent of the other except for the common heater. For typical operation as a resistance-coupled amplifier, refer to RESIST-ANCE-COUPLED AMPLIFIER SECTION. Type 12AU7 is a DISCONTINand as horizontal deflection oscillator, in television receivers. The 12AU7-A is also useful in applications critical as to microphonics. Outline 8B, OUTLINES SEC-TION. Tubes require miniature nine-contact socket and may be mounted in any vices. Also used as combined vertical oscillator and vertical deflection amplifier, UED type listed for reference only.

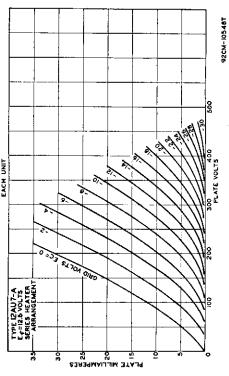
volts	ampere		ja	jď	ď
Parallel 6.3	0.3	Unit No.	1.5	1.6	0.35
Series 12.6	0.15	. Unit No.1	1.5	1.6	0.5
Heater Arrangement: Heater Voltage (ac/dd)	HEATER CURRENT.	DIRECT INTERELECTRODE CAPACITANCES for 12AUT-A (Approx.): Unit No.1	Grid to Plate	Grid to Cathode and Heater.	Plate to Cathode and Heater

CLASS A, AMPLIFIER (Each Unit Unless Otherwise Specified)

Maximum Katings for IZAU/-A, (Design-Maximum Values):		
PLATE VOLTAGE.	330 max	volts
PLATE DISSIPATION:		
Each Plate,	2. To max	watts
Both Plates (Both units operating).	o.o max	Watts
CATHODE CURRENT.	22 max	ma
Peak Heater-Cathode Voltage:		ı
Heater negative with respect to cathode	200 max	volts
Heater positive with respect to cathode	200 max	volts
 The de component must not exceed 100 volts. 		

	volts		ohms	ma	volts
	18 18 18 18 18 18 18 18 18 18 18 18 18 18 18 1	17	7700	10.5	-24
	100	19.5	6250	11.8	I
Characteristics for 12AU7-A;	Plate Voltage Grid Voltage	Amplification Factor.	Plate Resistance (Approx.)	Mate Current.	Grid Voltage (Approx.) for plate current of 10 µa

AVERAGE PLATE CHARACTERISTICS EACH UNIT



379

3AU6, 4AU6, 6AU6A 12AU6

For fixed-blas operation. For cathode-bias operation. Grid-Circuit Resistance:

Vertical-OSCILLATOR (Each Unit, Unless Otherwise Specified) For operation in a 525-line, 30-frame system

Horizontal-

volts	volts ma	E I	watts	volts volts
Oscillator 330 max	-560 max 330 max	22 max	2,75 max 5.5 max	200 max 200 max
Oscillator 330 max	-440 max 66 max	22 max	2,75 max 5,5 max	200 max 200™max
Maximum Ratings for 12AU7-A, $(Design_Maximum\ Values)$:	DC Plate Voltage Peak Negative-Pulse Grid Voltage	Peak Cathode Current	PLATE DISSIPATION: Each Plate	Both Place (Dout unto Operation) PER HEATER-CATHON VOITAGE: Heater negative with respect to cathode. Heater positive with respect to Cathode.

2.2 max megohms 2.2 max Grid-Circuit Resistance.... Maximum Circuit Value:

YERTICAL-DEFLECTION AMPLIFIER (Each Unit Unless Otherwise Specified) For operation in a 525-line, 30-frame system

imum Ratings for 12AU7-A, (Design-Maximum Values):

Volts	volts volts	8 E	İ	Watts	Watts	volts	volts	
330 max	1200 max -275 max	66 max	700	2.75 mar	ээш сте	200 max	200"mar	
WOAIMUM NOTHING	DC PLATE VOLTAGE.	PEAK NEGATIVE-PUISE GRID VOLTAGE.	AVERAGE CATHODE CURRENT.	PLATE DISSIPATION:	Each Plate Roth Plates (Both units operating)	PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathodic	Honton nogitive with respect to calmode

•		2.2 max megohms
Tener posture and language	Maximum Circuit Values:	Grid-Circuit Resistance:

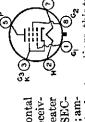
#The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds. For cathode-bias operation....

The dc component must not exceed 100 volts.

BEAM POWER TUBE

12AV5GA deflection amplifier in television receivers employing series-connected heater Glass octal type used as horizontal strings. Outline 19B, OUTLINES SEC-TION. Heater volts (ac/dc), 12.6; am-6AV5GA, 25AV5GA

Related types:



peres, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with glass octal type $6AV\bar{5}$ -GA.

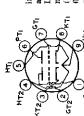
HIGH-MU TRIODE TWIN DIODE-

3AV6, 4AV6, 6AV6 **12AV6**

detector, amplifier, and ave tube in Miniature type used as combined automobile and ac-operated receivers. Outline 7B, OUTLINES SECTION.

0.15. Except for heater ratings, this type is identical with miniature type 6AV6. Heater volts (ac/dc), 12.6; amperes,

= Technical Data =



megohm

0.25 max 1.0 max

MEDIUM-MU TWIN TRIODE

in vhf tuners of television receivers, and as rf amplifier, oscillator, or mixer. Outline 8B, OUT-LINES SECTION. Tube requires miniature nine-contact socket. Heater volts (ac/dc), 12.6 (series), 6.3 (parallel); amperes, 0.225 (series), Miniature type used as frequency converter 0.45 (paralle)). Characteristics as class A1 am-

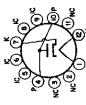
PTZ HM plifter (each unit): plate volts, 150 (300 max); cathode-bias resistor, 56 ohms; amplification factor, 41; plate resistance (approx.), 4800 ohms; transconductance, 8500 μmhos; plate ma., 18; plate dissipation, 2.7 max watts; peak heater-cathode volts, 90 max. This type is used principally for renewal



SHARP-CUTOFF PENTODE

Miniature type used as an rf or if amplifier up to 400 megacycles in compact ac/dc FM receivers. Outline 7B, OUTLINES SECTION. Tube re-

Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings and terminal connections, this type is identical with miniature type 6AG5. quires miniature seven-contact socket.



HALF-WAVE VACUUM RECTIFIER

tube in horizontal-deflection circuits connected heater strings. Outline 12C, Duodecar type used as damper of television receivers employing series-OUTLINES SECTION. Heater volts

|2AX3

6AX3, 17AX3

seconds. Except for heater ratings, this type is identical with duodecar type 6AX3 (ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11



12AX4GT

tubes in horizontal deflection circuits 12AX4GTA of television receivers. Types 12AX4-GTA and 12AX4-GTB have a con-12AX4GTB trolled heater warm-up time for use in line 14C, OUTLINES SECTION. These types may be supplied with pin Glass octal types used as damper series-connected heater strings. Out-No.1 omitted. Heater volts (ac/de),

Related types: 25AX4GTA

17AX4GT, 17AX4GTA, 6AX4GT, 6AX4GTB,

seconds. Except for heater rating, these types are identical with glass octal type 12.6; amperes, 0.6; warm-up time (average) for 12AX4-GTA and 12AX4-GTB, 11 6AX4-GT. Type 12AX4-GT is a DISCONTINUED type listed for reference only.



HIGH-MU TWIN TRIODE

plifier in radio equipment. The 12AX7 is also used in diversified applications Miniature types used as phase inverter or twin resistance-coupled amsuch as multivibrators or oscillators in

12AX7A

LINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. Each triode unit is independent of the other except for industrial control devices. Type 12AX7-A has controlled hum and noise characteristics and is used in high-fidelity audio-amplifier applications. Outline 8B, OUT-

common heater. For characteristics and curves, refer to type 6AV6. For typical operation as a resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER SECTION

Heater Arrangement:	Series	Parallel) A GO
Heater Voltage (ac/do)	12.6	6.3	
Heater Current	0.16	0.3	
Direct Interelectrode Capacitances (Approx.): Grid to Plate (Each unit) Grid to Cathode and Heater (Each unit) Plate to Cathode and Heater	Unit No. 1 1. 7 1. 6 0. 46	Unit No. 2 1.7 1.6 0.34	

olts Pere

n n

CLASS A1 AMPLIFIER (Each Unit)

Maximum Ratings, (Design-Maximum Vaines:)	330 4407	
PLATE VOLTAGE		٠
PLATE DISSIPATION		
GRID VOLTAGE:	7.5	
Negative-bias value		
Positive-bias value.		
PRAK HEATER-CATHODE VOLTAGE:	200 000	
Heater negative with respect to cathode		
Heater positive with respect to cathode	Table 0.07	
100 000		

volts

volts watts volts volts

The dc component must not exceed 100 volts.

Equivalent Noise and Hum Voltage, (Reference to Grid, Each Unit):* A verage Value Measured in "true rms" units under the following conditions: Heacr voltage (parallel connection), Measured in "true rms" units under the following conditions: Heacr voltage, 250 volts de: plate load 6.3 volts ac: center tap of heact reransformer grounded; plate supply voltage, 250 volts de: plate load 7. souls ac: center tap of heact reransformer grounded; plate supply voltage, 250 volts de: plate load 7. session, 100000 ohms; cathode resistor, 2700 ohms based by 100-μ capacitor; grid resistor, 0 ohms; and amplifier covering frequency range between 25 and 10000 cps.
--

HALF-WAVE VACUUM RECTIFIER

6AY3, 17AY3

Novar type used as damper tube in horizontal-deflection circuits of black-and-white television receivers. Tube has controlled warm-up time for use in series-connected heater strings.

Outline 17A, OUTLINES SECTION. Heater volts (ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater rating, this type is iden-₹ € tical with novar type 6AY3.

MEDIUM-MU TWIN TRIODE

K12@ 5T2 €02 amplifiers where reduction of microphonics, leakage noise, and hum are Miniature type used in the first stages of high-gain audio-frequency primary considerations. Outline 8B,

OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. Each triode unit is independent of the other except for the common heater. Use of the 12.6-volt connection with an ac heater supply is not recommended for applications involving low hum. For typical operation as a resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER **⊙**₹ SECTION

HEATER VOLTAGE (AC/DC) HEATER VOLTAGE (AC/DC) HEATER CURENT 0.15 AMPLIFICATION FATOR (Each unit)*	Series 12.6 0.15	Parallel 6.3 0.3 44	vo amp
Plate Resistance (Each unit, approx.)* Transconductance* * For plate volts, 250; grid volts, -4; plate ma., 3.		1750	din'

CLASS At AMPLIFIER (Each Unit)

Maximum Ratings (Design-Center Values): PLATE VOLTAGE....

otta

hos

watts	volts volts		
1.5 max 10 max	90 max 90 max		12AZ7
PLATE DISSIPATION CATHODE CHIRENT CATHODE CONTINENT VICE OF THE CONTINENT VICE OF CONTINENT CATHODE CONTINENT VICE OF CONTINENT CATHODE CONTINENT VICE OF CONTINENT CATHODE CO	FBAR IMMIRE-CARDON PULLAGE. Heater negative with respect to cathode. Heater positive with respect to cathode.	HT2 O PT HIGH-MU TWIN TRIODE	Miniature types used in direct- coupled cathode-drive if amplifier cir-

and may be mounted in any position. Heater volts (ac/dc):12.6 (series), 6.3 (parallel); amperes, 0.225 (series), 0.45 (parallel); warm-up time (average), 12AZ7-A, 11 seconds. Type 12AZ7 is a DISCONTINUED type listed for reference only. For characquire miniature nine-contact socket teristics, class A₁ amplifier, refer to miniature type 12AT7.

θ_{κη} cuits of vhf television tuners. Outline 8B, OUTLINES SECTION. Tubes re-

	W uhout	N 11 W	
	External	External	
DIRECT INTERELECTRODE CAPACITANCES (Approx.):	Shield	Shield	
Grid to Plate (Each unit)	61	1.9	Ħ
Grid to Cathode and Heater (Each unit)	2 6	63 90.	ď
Plate to Cathode and Heater:			
Unit No.1	0,44	1.4	ď
Unit No.2.	0.36	1.6	ď
• With external shield connected to eathode of unit under test.			

CLASS A, AMPLIFIER (Each Unit)

12AZ7

Maximum Ratings:	Design-Center Values	Design-Center Design-Maxi- Values mum Values	
Plate Voltage.	300 max	330 max	volts
GRID VOLTAGE, Negative-bias value	- 50 max	- 55 max	volts
PLATE DISSIPATION	2.5 max	2.5 max	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	200 max	200 max	volts
Heater positive with respect to cathode	200° mar	$200^{\circ}max$	volta
 The dc component must not exceed 100 volts. 			

Maximum Circuit Values (Each Unit):

Frid-Circuit Resistance:	For fixed-bias operation	For cathode-bias operation	

0.25 max 1 max

.........

veance used as vertical deflection amplifier in television receivers. This type has a controlled heater warm-up time Miniature type having high per-LOW-MU TRIODE

strings. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 12.6 (series), 6.3 (parallel); amperes, 0.3 (series), 0.6 (parallel); warm-uptime (average), 11 seconds. for use in series-connected heater

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Center Values):		
Prate Voltage Rin Voltage, Negative-bias value Prate Dissipation	550 max -50 max 5.5 max	volts volts watts
PEAK HEATENCATHODS VOLAGES Heater negative with respect to cathode Heater positive with respect to cathode	200 max 200°max	volts
Characteristics:	150	100
	-17.5	voita
Ampuirement ractor Plate Resistance (Approx.)	1030	ohms
		383

volts volts

-50 max 0 max 300 max

volts

Transconductance Plate Current. Grid Voltage (Approx.) for plate current of 200 µa. Plate Current for grid voltage of -23 volts.	6300 34 -32 9,6	mhos ma volta
Maximum Circuit Values: Erde-Circuit, Resistance: For fixed-bias operation. For cathode-bias operation.	0.47 max 2.2 max	megohm megohms
VERTICAL DEFLECTION AMPLIFIER For operation in a 585-line, 50-frame system		

Maximum Ratings, (Design-Center Values):

DC PLATE VOLTAGE	550 max	volts
Peak Positive-Pulse Plate Voltage# (Absolute Maximum)	1000tmax	volts
PEAK NEGATIVE-PULSE GRID VOLTAGE.	-250 max	volts
PEAK CATHODE CURRENT	105 max	en B
AVERAGE CATHODE CURRENT	30 max	EW
PLATE DISSIPATION	5.5 mar	watts
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode	200 max	volts
Heater positive with respect to cathode	200°max	volts

क्षेत्र थ प क

Maximum Circuit Value:

For cathode-bias operation. Grid-Circuit Resistance:

#The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning eyele. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

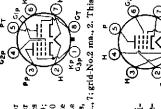
2.2 max megohms

| Under no circumstances should this absolute value be exceeded

The dc component must not exceed 100 volts.

TRIODE-PENTODE

ohms; transconductance, 2400 µmhos; plate ma., 2.8. Characteristics of periode unit: plate volta, 90; grid-No.2 volta, 90; grid-No.2 volts, 90; grid-No.1 volts, 3; plate resistance, 200000 ohms; transconductance, 1800 µmhos; plate ma., 7; grid-No.2 ma., 2. This is a DISCONTINUED type listed for reference only. amplification factor, 90; plate resistance, 37000 Glass octal type used as combined detector and rf or if amplifier in ac/de receivers. Heater volts (ac/de), 12.6; amperes, 0.3. Characteristics of triode unit; plate volts, 90; grid volts, 0;



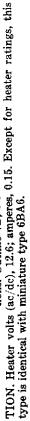
REMOTE-CUTOFF PENTODE

ceivers, in FM receivers, and in other wide-band, high-frequency applica-Miniature type used as rf amplifier in ac/de standard broadcast retions. Outline 7B, OUTLINES SEC-

12BA6

Related types:

3BA6, 6BA6



PENTAGRID CONVERTER

SECTION. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater rating, this type is dentical with miniature type 6BA. Type 12BA? is used principally for renewal purposes. Miniature type used as converter in ac/dc FM broadcast band, Outline 8D, OUTLINES superheterodyne circuits especially those for the **2BA7**

Related type: 6BA7



Miniature type used as rf or if amplifier in

REMOTE-CUTOFF PENTODE

radio receivers. Outline 7B, OUTLINES SEC-TION. Heater volts (ac/dc), 12.6; amperes,

2BD6

Related type:

6.15. Except for heater rating, this type is identical with miniature type 6BD6. Type 12BD6 is used principally for renewal purposes.

- Technical Data

PENTAGRID CONVERTER

Miniature type used as converter in ac/dc receivers for both standard OUTLINES SECTION. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is identical broadcast and FM bands. Outline 7B, with miniature type 6BE6

Related types:

3BE6, 6BE6

Related type:

MEDIUM-MU TRIODE TWIN DIODE-

ers operating from a 12-volt storage detector, amplifier, and ave tube primarily in automobile radio receiv-Miniature type used as combined

battery.Outline 7B, OUTLINES SEC-(ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is identical with miniature type 6BF6. TION. Heater volts

MEDIUM-MU TWIN TRIODE

HT2

Miniature types used as combined flection oscillators, in television receivvertical deflection amplifiers and vertical oscillators, and as horizontal de-ڙ ڪ

G. 20

12BH7A ers. Type 12BH7-A has a controlled

heater warm-up time for use in series-connected heater strings. These types are also used in other applications including phase-inverter circuits and multivibrator circuits. Outline 8D, OUTLINES SECTION. Tubes require miniature nine-contact socket and may be mounted in any position. Each triode unit is independent of the other except for the common heater. Type 12BH7 is a DISCONTINUED type listed for reference only. **⊙**₹

EATER ARRANGEMENT:	Series	rarattet	
EATER VOLTAGE (AC/DC)	12.6		volts
EATER CURRENT.	0.3	9.0	smpere.
EATER WARM-UP TIME (Average) for 12BH7-A	ı	11	seconds
TRECT INTERELECTRODE CAPACITANCES (Approx.):	Unit No.1	Unit No.2	
Grid to Plate.	2.6	9.	ቯ
Grid to Cathode and Heater	63.	63 63	þ
Plate to Cathode and Heater	0.5	4.0	ď
Plate of Unit No.1 to Plate of Unit No.2.	8.0		ā

CLASS A, AMPLIFIER (Each Unit)

Maximum Ratings, (Design-Center Values):		
PLATE VOLTAGE.	300 max	volta
Negative-bias value Positive-bias value	-50 max 0 max	volts volts
CATHODE CURRENT.	20 max	812
Each Plate. Both Plates (Both units operating)	3.5 max 7 max	watts watts
Peak Heater-Cathods Voltage: Heater negative with respect to cathode. Heater positive with respect to cathode.	200 max 200max	volta
The dc component must not exceed 100 volts.		
Charactershics: Plate Voltage. Grid Voltage.	250 -10.6	volts volts

82CM-7742TI

Amplification Factor. Plate Resistance (Approx.) Transconductance (Approx.) for plate current of 50 µa. Plate Current. Plate Current.		16.5 5300 3100 -23 11.5	ohms µmhos volts ma ma	
Maximum Circuit Values: Grid-Circuit Resistance: For fixed-bias operation.	::	0.25 max 1.0 max	теgоћт теgоћт	
OSCILLATOR (Each Unit) For operation in a 525-line, \$0-frame system	. Bysten			
Maximum Ratings, (Design-Center Values): D. D. a.m. Vor 1840.	Vertical Deflection Oscillator 450 max	Horizontal Deflection Oscillator 450 max	volts	
		200	1	

	1	1110/01/01	
	Deflection	Deflection	
Maximum Ratinas. (Design-Center Values):	Oscillator	Oscillator	
DC Prame Voltage	450 max	450 max	volts
Deve Negative Pings Gaid Voltage	-400 max	-600 max	volts
PEAK CATHODE CURRENT.	70 max	300 max	ma
AVERAGE CATHODE CURRENT	20 mar	20 max	ma
PLATE DISSIPATION:	,		440
Each Plate,	3.5 max	2 mar.	Water
Both Plates (Both units operating)	r_{max}	max.	Wates
PEAR HEATER-CATHODE VOLTAGE:			141
Heater negative with respect to cathode	200 max	200 200	VOICE TOTAL
Heater positive with respect to cathode	zon~max	200-11402	AOICE
Maximum Circuit Values:		1	,
Grid-Circuit Resistance	2.2 max	2.2 max	megohma

AMPLIFIER (Each Unit)	5-line, 50-frame system
VERTICAL DEFLECTION	For operation in a 52.

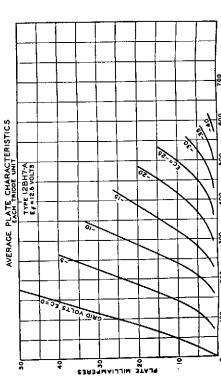
2.2 max	For cathode-bias operation.
	Maximum Circuit Value:
200 max 200°max	Heater negative with respect to cathode Heater positive with respect to cathode
3.5 max 7 max	Each Plate. Both Plates (Both units operating).
20 max	PEAK CATHODE CURRENT AVERAGE CATHODE CURRENT
-250 max	PEAR FORITIVE-FULSE FLATE VOLIAGE# (Account managem)
450 max	DC PLATE VOLTAGE.

2.2 max megohms

The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

Indee no circumstances should this absolute value be exceeded.

The dc component must not exceed 100 volts.



BEAM POWER TUBE

= Technical Data



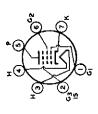
Miniature type used in audio output stages of television and radio receivers employing series-connected heater strings. Outline 8D, OUTLINES SECTION. Heater volts (ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11 seconds. Peak heater-cathode volts, 200 max. When the heater is positive with respect to the cathode, the de component of the heater-cath-

2BK5

P ode voltage must not exceed 100 volts. Except for heater and heater-cathode ratings, this type is identical with miniature type 6BK5. Type 12BK5 is used principally for renewal purposes.

Related types: **6BK5, 25BK5**

REMOTE-CUTOFF PENTODE



Miniature type used as if and rf amplifier in automobile radio receivers operating from a L2-volt storage battery. Outline TB, OUT-LINES SECTION, Tube requires miniature seven-contact socket. Heater-voltage range (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.15. Characteristics as class A₁ amplifier: heater volts, 12.6; plate and grid-No.2 volts, 12.6 (30 max); grid No.3 connected to cathode at socket;

conductance, 1350 µmhos; plate ma., 1.35; grid-No.2 ma., 0.5; cathode ma., 20 max; peak heater-cathode grid-No.1 volts, 0 max; grid-No.1 resistor, 2.2 megohms, plate resistance (approx.), 0.5 megohm; transvolts, 30 max. This type is used principally for renewal purposes.



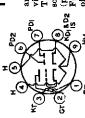
watts watts volts volts

volts na ma

BEAM POWER TUBE

12BQ6GTB Outline 15C, OUT- seasoffs/scus: 1780soffs, LINES SECTION. This type may be Glass octal type used as horizontaldeflection amplifier in television reseries-connected ceivers employing heater strings.

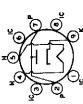
supplied with pin No.1 omitted. Heater volts (ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with 25BQ6GTB/25CU6 glass octal type 6BQ6-GTB/6CU6.



TWIN DIODE—HIGH-MU TRIODE

Miniature type used as combined sync separator and horizontal phase detector in television receivers. Outline 8B, OUTLINES SEC-TION. Tube requires ministure nine-contact socket. Heater volts (ac/dc), 12.6 (series), 6.3 (parallel); amperes, 0.225 (series); 0.45 (parallel). For maximum ratings, characteristics, and curves of triode unit, refer to type 12AT7. Maximum ratings of diode units (each unit); peak inverse

plate volts, 300 maz; peak plate ma., 60 maz; peak heater-cathode volts, 200 maz (the de component must not exceed 100 volts). Type 12BR7 is used principally for renewal purposes.



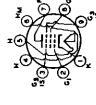
HALF-WAVE VACUUM RECTIFIER

Novar type used as damper tube in horizontal-deflection circuits of blackand-white television receivers employing series-connected heater strings. Outline 10D, OUTLINES SECTION

12BS3 Related types: **6853, 17853** Heater volts (ac/de), 12.6; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with novar type 6BS3.

SHARP-CUTOFF PENTODE

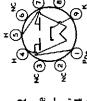
Miniature type used as video amplifier in television receivers. Outline 8D, OUTLINES SECTION, Tube requires miniature nine-con-Maximum ratings as class A1 amplifier: plate volts, 300 maz; grid-No.38 volts, 0 maz; grid-No. No.2 volts, 175 maz; grid-No.1 volts, 50 maz; plate dissipation, 6.25 max watts; grid-No.2 intact socket. Heater volts (ac/de), 12.6 (series), 6.3 (parallel); amperes, 0.3 (series), 0.6 (parallel).



put, 1 max watt; peak heater-cathode volts, 200 max (the dc component must not exceed 100 volts). This type is used principally for renewal purposes.

FULL-WAVE VACUUM RECTIFIER

Miniature type used in full-wave power supplies having high de outrequires miniature nine-contact socket put current requirements. Outline 8D, OUTLINES SECTION. Type 12BW4



and may be mounted in any position. Heater volts (ac/dc), 12.6; amperes 0.45. It equately ventilated. Except for heater ratings, this type is identical with miniature is especially important that this tube, like other power-handling tubes, be adtype 6BW4

SHARP-CUTOFF PENTODE

12BY7

Miniature types used as video amplifier in television receivers. Type 12BY7-A has a controlled heater warm-up time for use in series-connected heater strings. Outline 8D,



OUTLINES SECTION. Tubes require miniature nine-contact socket and may be mounted in any position. Type 12BY7 is a DISCONTINUED type listed for reference only.

volts ampere seconds pf	volts volts volts volts watts watts volts	voits t socket voits ohms umbins ma ma ma
Parallel 6.3 0.6 11 10.063 3.5	330 max 0 max 190 max -55 max 1.2 max 6.5 max 200 max	250 led to cathode a 180 100 93000 11000 26 5.75
HEATER ARRANGEMENT: HEATER VOLTAGE (AC/DC) 12.6 HEATER VORREST. OBJECT INTERELECTROPE (Average) for 12BY7-A. ORDING IN VOL TO Plate. Grid No.1 to Plate. Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	CLASS A ₁ AMPLIFIER Maximum Ratings, (Design-Maximum Values): PLATE SUPLY VOLTAGE GRID-NO.3 (SUPRESSOR-GRID) VOLTAGE, Positive value GRID-NO.2 (SURENCARD) VOLTAGE. GRID-NO.1 (CONTROL-GRID) VOLTAGE. Negative-bias value Positive-bias value GRID-NO.2 LAPUT PLATE DISSIBATION PLATE DISSIBATION PLATE PRESENCATHODE VOLTAGE. Heater negative with respect to cathode. Heater positive with respect to cathode.	Characteristics: Plate Supply Voltage Grid No.3 Grid-No.2 Supply Voltage Grid-No.2 Supply Voltage Grid-No.2 Supply Voltage Cathode-Base Resistor Transconductance Transconducta

Maximum Circuit Values:

= Technical Data ==

Grid-No.1-Circuit Resistance:
For Mad-bias operation
For eathode-bias operation

The dc component must not exceed 100 volts.

megohm megohm 0.25 max 1 max

SOLESING THE CHARACTERISTICS

							_										۴	92CM-0234TI
											_		_				004	95CK
(C.S												5.2	-3.0	£ C1 = -4.0	0 S-	3	900	
AKAC I ERIS				+1.5	41.0	- c-	TS EC. *0	-0.5	- -	5.1-	1-2.0			נכוב			400	OLTS
AVERAGE PLATE CHARACTERISTICS			; <u>;</u>			-	GRID-NE I VOLTS ECIED										300	PLATE VOLTS
AVE HAG	EMENT. SHIELD	ODE AT		-		+	+	-	-				-	 			200	
	TYPE 12BY7-A E¢=12.6 VOLTS SERIES HEATER ARRANGEMENT. GRID N® 3 ANO INTERNAL SHIELO	CONNECTED TO CATHODE AT SOCKET. GRID-N#2 VOLTS=180	-	1	1			7	1		+	1	+				ô	
	EF=12.6	SAID-ORNE	021		34	3d P	רועו	2	31	17	-	•	7	<u>t</u>	7	$^{\parallel}$	٠	

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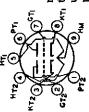
SEMIREMOTE-CUTOFF PENTODE

12BZ6

3BZ6, 4BZ6, 6BZ6

Miniature type used in gain-controlled video if stages of television SECTION. Tube requires miniature seven-contact socket and may be receivers. Outline 7B, OUTLINES

0.15. Except for mounted in any position. Heater volts (ac/dc), 12.6; amperes, heater ratings, this type is identical with miniature type 6BZ6.



HIGH-MU TWIN TRIODE

Θκη, television receivers. This tube is also used in clipping circuits and in generalrator and sync-amplifier circuits of Miniature type used in sync-sepa-

Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 12.6 (series), 6.3 (parpurpose audio amplifier applications. allel); amperes, 0.3 (series), 0.6 (parallel).

CLASS A1 AMPUHER (Each Unit)

Maximum Ralings, (Design-Center Values):		
PLATE VOLTAGE	300 max	volts
GRID VOLTAGE:	9	-114-
Negative-bias value	-D0 max	AOTOA
Positive-bias value	0 max	volta
PLATE DISSIPATION.	1.5 max	watts
PEAR HEATER-CATHODE VOLTAGE:		i
Heater negative with respect to cathode	180 max	volts
Heater positive with respect to cathode	180 max	volts
Characteristics:		
Plate Voltace	250	volta
Grid Voltage	21	volts
	100	,
_	31800	ohma
Transconductance	3200	*mpoa
Plate Current.	5.5	Æ

Grid-Circuit Resistance: For contact-potential-bias operation.....

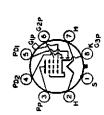
Refer to type 12CU5/12C5

5 max megonms

TWIN DIODE-

SEMIREMOTE-CUTOFF PENTODE

Metal type used as combined detector, amplifier, and ave tube in ac/de receivers. Outline 3, OUTLINES SECTION. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is identical with metal type 6B8. Type 12C8 is used principally for renewal



BEAM POWER TUBE

Miniature type used in the audio output stages of television receivers. This type has a connected heater strings. Outline 7C, OUT-LINES SECTION. Tube requires ministure seven-contact socket. Heater volts (ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11 seconds. Peak heater-cathode volts: heater negacontrolled heater warm-up time for use in series-

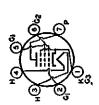
> Related types: 6CAS, 25CAS



tive with respect to cathode, 300 max (the dc component must not exceed 200 volts); heater positive with respect to cathode, 200 max (the dc component must not exceed 100 volts). Except for heater and heater-cathode ratings, this type is identical with ministure type 6CA5.

REMOTE-CUTOFF PENTODE

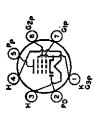
mobile radio receivers operating from a 12-volt storage battery. Outline 7C, OUTLINES SECsocket. Heater-voltage range (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.45. Characteristics as Miniature type used as if amplifier in auto-TION. Tube requires miniature seven-contact class A smplifier: heater volts, 12.6; plate and



grid-No.2 voits, 12.8 (16 maz); grid-No.1 voits 63 maz; grid-No.1 resistor (bypassed), 2.2 meg-ohms; plate resistance (approx.), 0.04 megohm; transconductance, 3800 µmhos; plate ma., 4.5; grid-No.2 ma., 3.5; peak heater-cathode volts, 16 *mox*. This type is used principally for renewal purposes.

REMOTE-CUTOFF PENTODE

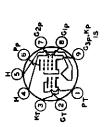
detector and audio amplifier in automobile and ac-operated radio receiv-Miniature type used as combined detector, and the pentode unit as an ers. The diode unit is used as an AM



Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is identical with miniature type 6CR6. automatic-volume-controlled audio amplifier. Outline 7B, OUTLINES SECTION

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-

Miniature type used in television receivers separator, and sync-clipper circuita, Outline 8D, OUTLINES SECTION. Tube requires minitode unit is used as video amplifier; triode unit is used in sweep-oscillator sync-amplifier, syncature nine-contact socket. Heater volts (ac/dc), 12.6; amperes, 0.3; warm-up time (average), 11 seconds. Characteristics of triode unit as class employing series-connected heater strings. Pen-



mux); cathode-bias resistor, 82 ohms; plate resistance (approx.), 0.15 megohm; transcenductance, 7000 μπλος; plate ma., 15; grid-No.2 ma., 3.4; plate desistation, 2.75 max watts; grid-No.2 input, 0.9 max watt. Peak heater-cathode volts, 209 max (the de component must not exceed 100 volts when heater is positive with respect to cathode). This type is used principally for renewal purposes. 46; plate resistance (approx.), 8200 ohms; transcanductance, 4900 μ mhos; plate ma., 9; plate dissipation, 2.5 max watts. Pentode unit: plate supply volts, 200 (300 max); grid-No.2 supply volts, 125 (300 At amplifier: plate supply volts, 150~(300~max); cathode-bias resistor, $150~\mathrm{ohms}$; amplification factor,

= Technical Data

BEAM POWER TUBE

Miniature type used in the audio output stage of television receivers employing series-connected heater strings. Heater volts (ac/dc), 12.6; amperes, Outline 7C, OUTLINES SECTION

/12C5 Related types: 6CUS, 17CUS

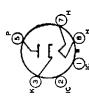
(average), 11 seconds. Except for heater rating, this type is identical with miniature type 6CU5. 0.6; warm-up time

Refer to type 12BQ6-GBT/12CU6

REMOTE-CUTOFF PENTODE

ing directly from 12-volt storage-battery systems, Outline 7B, OUTLINES SECTION, Tube voltage range (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.15. Characteristics as class A₁ amrequires miniature seven-contact socket, Heater-Miniature type used as rf amplifier in low B+ voltage automobile radio receivers operat-

cathode at socket; grid-No.1 volts, 0 maz; grid-No.1 resistor (bypassed), 2.2 negohms; plate resistance (approx.), 0.04 megohm; transconductance, 3100 µmhos; plate ma., 3; grid-No.2 ma., 1.4; peak heater-cathode volts, 30 mar. This type is used principally for renewal purposes. pliffer: heater volts, 12.6; plate and grid-No.2 volts, 12.6 (33 max); grid No.3 connected to



HALF-WAVE VACUUM RECTIFIER

Glass octal type used as damper diode in horizontal-deflection circuits connected heater strings. Outline 14C, of television receivers employing series-OUTLINES SECTION. Tube re-

quires octal socket and may be mounted in any position. Socket terminals 1, 2, 4, and 6 should not be used as tie points. This type may be supplied with pin 1 omitted. It is especially important that this tube, like other power-handling tubes, be adequately ventilated. Heater volts (ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11 seconds.

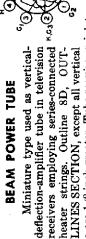
For operation in a 525-line, 30-frame system

	volts	E C	E TOTAL	Watto		5	NOI CR
	4400 max	300 max	TDD Max	0.0 max		4400 2002	ann_max
Maximum Ratings, (Design-Maximum Values):	Peak Inverse Plate Voltage	PEAK PLATE CURRENT	DC PLATE CURRENT	PLATE DISSIPATION.	Peak Heater-Cathode Voltage:	Heater negative with respect to cathode#	Heater positive with respect to cathode

* The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

The dc component must not exceed 900 volts.

The de component must not exceed 100 volts.



dimensions of this type are 1/8 inch greater. Tube requires miniature nine-contact socket and may be operated in any position. Heater volts (ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11 seconds.

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Center Values):		
PLATE VOLTAGE.	300 max	volta
GRID-No.2 (SCREEN-GRID) VOLTAGE.	150 max	volte
GRID-No.2 INPUT	1.25 max	Watts
PLATE DISSIPATION	10 max	watts
FEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	2000 200	volte
Heater positive with respect to cathode	200 max	volta
Typical Operation:		
Plate Supply Voltage	200	volts
Grid-No.2 Supply Voltage	125	volts
Cathode-Bias Resistor	180	ohma
Peak AF Grid-No.1 Voltage	20,52	volte
Zero-Signal Plate Current	46	E
Maximum-Signal Plate Current	4.7	E
Zero-Signal Grid-No.2 Current	61	BE
Maximum-Signal Grid-No.2 Current	80	6
Plate Resistance (Approx.)	28000	ohme
Transconductance	8000	soquir
Load Resistance	4000	ohma
Total Harmonic Distortion	01	per cent
Maximum-Signal Power Output	eo eo	watts
Maximum Circuit Values:		
For fixed-bias operation	0.1 max	megohm
For cathode-bias operation.	2.2 max	megon ma

I AMPLIFIER	e, 30-frame system	
VERTICAL-DEFLECTION AL	For operation in a 525-line,	Design-Center Values):

Maximum Ratings, (Design-Center Values):		
DC PLATE VOLTAGE	300 max	
Pear Positive-Pulse Plate Voltage (Absolute Maximum)*.	2000 max	
DC GRIP-No.2 (SCREEN-GRID) VOLTAGE	150 max	
PEAK NEGATIVE-PULSE GRID-NO.1 (CONTROL-GRID) VOLTAGE.	-250 max	
PEAK CATHODE CURRENT	200 max	
AVERAGE CATHODE CURRENT	55 max	
GRID-No.2 Input	1.25 max	-
PLATE DISSIPATION.	10 max	•
Peak Heater-Cathode Voltage:		
Heater negative with respect to cathode	200 max	
Heater positive with respect to cathode	200 max	
Maximum Circuit Values:		

The de component must not exceed 100 volts. For fixed-bias operation.

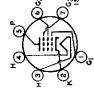
 The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a
625-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.
 Under no circumstances should this absolute maximum value be exceeded.

REMOTE-CUTOFF PENTODE

Miniature type used in automobile radio

receivers; pentode unit is used as rf or if amplifier. Outline 8B. OUTLINES SECTION.
Tube requires ministure mine-contact socket.
The acter-voltage range (av. de.), 10 to 18.9; amplifier the act 12.6 volts 0.2. Characteristics of pentode unit as class At amplifier; heater volts, 12.6 (90 max); grid No.3 connected to enthode at socket; grid-No.1 volts (developed across 2.2-megohm resistor); one, 13.5; exthode max, 20 max; peak heater-cathode volts, 30 max. Maximum diode plate na., 13; grid-No.2 woltage drop for plate are volts. This type is used principally for renewal purposes.

= Technical Data =



SHARP-CUTOFF PENTODE

Miniature type used as if-amplifier tube in television receivers. Outer volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type line 7B, OUTLINESSECTION. Heatis identical with miniature ${
m type}$ 6DK6.

3DK6, 6DK6

TWIN DIODE - POWER TETRODE

12-volt storage-battery systems. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket. Heater-voltage range ave diode, and power amplifier in low B+voltage automobile radio receivers operating from Typical operation of tetrode unit as class A. Miniature type used as combined detector, (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.5. amplifier: heater volts, 12.6; plate and grid-

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signal source), 1.4; plate ma., 6 (zero-signal), 2.5 (maximum-signal); load resistance, 3500 ohms; maxi-ruum-signal power output, 10 milliwatts; plate dissipation, 0.5 *max* watt; peak heater-cathode volts, 30 max. Diode characteristics (each unit); heater volts, 12.6; plate volts, 10; plate ma., 1. This type is No.2 volts, 12.6 (30 max); grid-No.1 resistor, 15 megohms; peak af grid-No.1 volts (from 0.2-megohm used principally for renewal purposes.



and power amplifier driver in low B+ voltage automobile radio receivers operating directly from 12-volt storage-battery systems. Outline OUTLINES SECTION. Tube requires range (ac/dc), 10 to 15.9; amperes at 12.5 volts, 0.55. Typical operation of tetrode unit as audio driver: heater volts, 12.6; plate volts, 12.6 (30 Miniature type used as combined detector miniature nine-contact socket. Heater-voltage 8D.

and grid-No.1 volts, 12.6; grid-No.2 volts, -0.5; plate resistance (approx.), 480 ohms; transconductance (grid No.2 to plate), 7.2. Maximum diode plate (grid No.2 to plate), 7.2. Maximum diode plate max); grid-No.2 (control-grid) volts (obtained by rectification through a 2.2-megohm resistor), -2 grid) volts, 12.6 (16 *absolute maz*); plate ma., 40 (zero-signal), 8 (maximum signal); grid-No.1 ma., 75; load resistance, 800 obms; maximum-signal power output, 40 milliwatts. Characteristics: plate, heater, (-20 max); peak af grid-No.2 volts (obtained from 0.1-megohm source), 2.5; grid-No.1 (space-chargema. (each unit), 5. Peak heater-cathode volts, 30 mar. This type is used principally for renewal purposes.

volts volts volts

watts watts

voite voits

B B



0.1 max megohm 2.2 max megohms

HALF-WAVE VACUUM RECTIFIER

tube in horizontal-deflection circuits of Glass octal type used as damper television receivers employing seriesconnected heater strings. Outline 14F,

OUTLINES SECTION. Heater volts

2DM4 Related types: 6DM4, 17DM4

(ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater Glass octal types used as horizontal-deflection-amplifier tubes in telenected heater strings. Outline 21, OUTvision receivers employing series-conrating, this type is identical with glass octal type 6DM4. BEAM POWER TUBE

12DQ6B **2DQ6A** Related types:

time (average), 11 seconds. Except for heater ratings, these types are identical with 17DQ6A, 17DQ6B 6DQ6A, 6DQ6B,

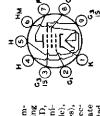
LINES SECTION. Heater volts

(ac/dc), 12.6; amperes, 0.6; warm-up

glass octal types 6DQ6-A and 6DQ6-B, respectively.

POWER PENTODE

onds. Characteristics as class A1 amplifier: plate Miniature type used as video-output-am-plifier tube in television receivers employing ature nine-contact socket. Heater volts (ac/dc), 12.6 (series), 6.3 (parallel); amperes, 0.3 (series), 0.6 (parallel); warm-up time (average), 11 secsupply volts, 200 (330 max); grid-No.3 connected to cathode at socket; grid-No.2 supply volts, series-connected heater strings. Outline 8D, Tube requires mini-OUTLINES SECTION.



ance, 16500 umhos; plate ma., 26; grid-No.2 ma., 5.6; plate dissipation, 6.5 mar watts; grid-No.2 input, 1.1 mar watt; peak heater-cathode volts, 200 mar (the de component must not exceed 100 volts 125 (330 max); cathode-bias resistor, 68 ohms; plate resistance (approx.), 53000 ohms; transconductwhen heater is positive with respect to cathode). This type is used principally for renewal purposes.

TWIN DIODE—POWER TETRODE

12DS7A **|2DS7**

Miniature types used as combined detectors and power-amplifier drivers in low $B\!+\!\mathrm{volt}\text{-}$ rectly from 12-volt storage-battery systems. Outvoltage range (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.4. Maximum ratings of tetrode unit quire miniature nine-contact socket. Heater as audio driver: plate and grid-No.2 (controlage automobile radio receivers operating diline 8D, OUTLINES SECTION. Tubes re-

Characteristics and typical operation with grid-No.2-resistor bias, refer to type 12DLS. Maximum diode plate ma. (each unit). 5. Type 12DS7-A is a DISCONTINUED type listed for reference only. grid) volts, 16 maz; grid-No.1 (space-charge-grid) volts, -16 maz; peak heater-cathode volts, 16 maz Type 12DS7 is used principally for renewal purposes.

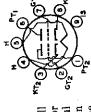
BEAM POWER TUBE

Related type:

Miniature type used as verticaldeflection-amplifier tube in television receivers employing series-connected heaterstrings. Outline 8D, OUTLINES

amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this SECTION. Heater volts (ac/dc), 12.6;

type is identical with type 6DT5.



HIGH-MU TWIN TRIODE

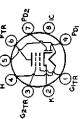
12DT8 Related type: **6**D18

Miniature type used as push-pull and mixer in FM tuners. Also useful in a wide variety of applications in radio and television receivers. Outline rf amplifier and as combined oscillator

heater ratings, interelectrode capacitances, and basing arrangement, this type is identical with miniature type 12AT7. Except for heating ratings, type 12DT8 is 8B, OUTLINES SECTION. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for identical with miniature type 6DT8.

TWIN-DIODE-POWER TETRODE

0.25. Typical operation of tetrode unit as audio driver: heater volts, 12.6; plate and grid-No.2



Maximum Circuit Values:

volts, 12.6 (16 max); grid-No.1 voltage obtained by rectification through 2.2-megohm resistor; peak af grid-No.1 volts, 2.2; load resistance, 2700 ohms; maximum-signal power output, 25 milliwatts. Maximum diode plate ma. (each unit), 1. Peak heater-cathode volts, 16 max. This type is used principally for renewal purposes.

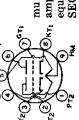
TWIN DIODE-POWER TETRODE

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8D, OUTLINES SECTION. Tube requires miniature nine-contact socket. Heater-voltage from 12-volt storage-battery systems. Outline range (ac/de), 10 to 15.9; amperes at 12.6 volts, 0.375. Typical operation of tetrode unit as audio and power-amplifier driver in low B+ voltage Miniature type used as combined detector 7)627Rautomobile radio receivers operating directly driver: heater volts, 12.6; plate and grid-No.1

18 ohms; peak af grid-No.2 supply volts (obtained from 0.3-megohm signal source), 1.2; plate resistance (approx.), 900 ohms; transconductance (grid No.2 to plate), 8500 µmhos; amplification factor (grid No.2 to plate), 7.6; indicated-signal plate ma., 6.8; grid-No.1 ma., 54; load resistance, 1250 ohms; indicated-(space-charge-grid) supply volts, 12.6 (16 max); grid-No.2 resistor, 4.7 megohms; cathode-bias resistor, signal power output, 5 milliwatts. Maximum diode plate ma. (each unit), 5. Peak heater-cathode volts 16 max. This type is used principally for renewal purposes.

DUAL TRIODE



Miniature type containing highmu and medium-mu triodes; used as amplifier and phase inverter in audio SECTION. Tube requires miniature equipment. Outline 8B, OUTLINES

nine-contact socket and may be operated in any position. Heater volts (ac/dc), 12.6 (series), 6.3 (parallel); amperes, 0.15 (series), 0.3 (parallel)

CLASS A, AMPLIFIER

the virusin Defines (Danies Manies Walnut)			rimin Mar	71.77 97. 0	
MUAIMUM KUMBS, (Design-Maximum Pakaes).		-	U #16 17 0.1	Cuit No.z	
PLATE VOLTAGE,			330 max	330 max	volts
GRID VOLTAGE:					
Negative-bias value.	:	-	55 max	ı	volts
Positive-bias value			0 max	1	volts
CATHODE CURRENT.	:		ı	22 max	ma
PLATE DESIPATION			1.2 max	3.3 max	Watte
PEAK HEATER-CATHODE VOLTAGE:					
o cathode			200 max	200 max	volts
Heater positive with respect to cathode.		:	$200^{\circ}max$	$200^{\circ}max$	volts
•					
Characteristics:	Unil No.1	Vo.1	Unit	Unit No.2	
Plate Voltage	100	250	100	250	volts
Grid Voltage	7	63	0	10. 20.	volta
Amplification Factor	100	100	20	17	
٠.	00008	62500	6500	7700	ohms
:	1250	1600	3100	2200	mpos
Plate Current	0.5	1.2	11.8	10.5	ma
Grid Voltage (Approx.) for plate current of 10 µs	ı	ı	1	-24	volta

ave, and power-amplifier driver in low B+voltage automobile radio receivers operating di-Miniature type used as combined detector, rectly from 12-volt storage-battery systems. Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket. Heater-voltage range (ac/dc), 10 to 15.9; amperes at 12.6 volts,

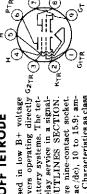
Unit No.1 0.25 max o The de component must not exceed 100 volts. For cathode-bias operation... For fixed-bias operation. Grid-Circuit Resistance:

0.25 max megohm 1 max megohm

Unit No.2

REMOTE-CUTOFF TETRODE MEDIUM-MU TRIODE-

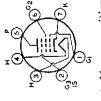
automobile radio receivers operating directly GZTR Tube requires miniature nine-contact socket. Heater-voltage range (ac/dc), 10 to 15.9; amseeker. Outline 8B, OUTLINES SECTION. peres at 12.6 volts, 0.35. Characteristics as class from 12-volt storage-battery systems. The tet-Miniature type used in low B+ voltage rode unit is used for relay service in a signal-



2.2 megohms; amplification factor (triode unit), 20; plate resistance (apprex.), 10000 ohms (triode unit), 5000 ohms (tetrode unit); transconductance, 2000 µmhos (triode unit), 6000 µmhos (tetrode unit); plate ma., 1.2 (triode unit), 14 (tetrode unit); grid-No.2 ma. (tetrode unit), 2; peak heater-cathode volts, 16 max. This type is used principally for renewal purposes. At amplifier: heater volts, 12.6; plate and grid-No.2 (pentode unit) volts, 12.6 (16 max); grid volts (triode unit), 0; grid-No.1 resistor (pentode unit),

REMOTE-CUTOFF PENTODE

Miniature type used as rf and if bile radio receivers operating directly amplifier in low B+ voltage automofrom 12-volt storage-battery systems. Outline 7B, OUTLINES SECTION.



volts Tube requires miniature seven-contact socket and may be mounted in any position.

HEATER CURRENT (Approx.) at 12.6 volts	an
DIRECT INTERESCENDED CARACLIANCES. Office No.1 to Plate Grid No.1 to Carbook Heater, Crid No.2, Grid No.3, and Internal Shield 9.5 Grid No.1 to Carbook Heater, Grid No.2, Grid No.3, and Internal Shield 9.5 While Many No.2, to Jack No.2, Grid No.3, and Internal Shield 4	77.

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CLASS A, AMPLIFIER

Maximum Ratings, (Design-Maximum Values):

2011 61	Trau	o max	16	22.0
PLATE VOLTAGE,	GRID-NO.2 (SCREEN-GRID) VOLTAGE.	CRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	PEAK HEATER-CATHODE VOLTAGE:	The state of the s

volts volts volts volts volts

> 16 max Characteristics with 12.6 Volts on Heater:

12.6 volts Connected to cathode at socket CHARACTERISTICS Plate Voltage. Grid No.3. AVERAGE

							7] 	399T
EC120		TS HELD TAT SOCKET.		_	6.9	<u> </u>		Ec.=0			50.5	<u>-</u>	2	\$12	-	· _		22 24 2	92CM-10399T
GRID-NAI VOLTS ECITO		GRID NAS AND INTERNAL SHIELD COMMETTED TO CHANGE AT SOCKET.	OLTS=12.6	_		1											_	16 20	
SPE	\	TYPE 12DZ6	GRID-N#2 VOLTS=12.6			1		21 21 1			 - 				1			2	PLATE VOLTS
	4			. <u>-</u> -		_\	-	" 	H	-	1111.		Y.		H		-	10	7
				\	\ \ \	/	\ 			\ \ \	<u> </u>	1	$\Big $			-			
				<u></u>		\ \ \	<u>`</u>	×	X		/	1	/			#		*	
_	\$	1839M	41-	אורו	(*	DI.	s (4 4	dia	10 1	40 ((9	Ι)	3.		74	1	ٳ	

= Technical Data ==

volts	megohma	ohme	40mm	volts	野田
12.6 0	000	25000	0000	4. 5.5	61 61
Grid-No 2 Voltage Grid-No.1 Supply Voltage	Grid-No.1 Resistor (Bypassed) Grid-No.3 Resistor (Bypassed)	Plate Resistance (Approx.)	Grids No.1 and No.3 Supply Voltage (Approx.) for transconductance, grid	No.1 to plate, of 10 amnos. Plate Current.	Grid-No.2 Current

Grid-No.1-Circuit Resistance Grid-No.3-Circuit Resistance Maximum Circuit Values:

10 max megohms 10 max megohms For longest life, it is recommended that the heater be operated within the voltage range of 11 to 14 volts.

REMOTE-CUTOFF PENTODE

tems, Outline 7B, OUTLINES SECTION. Tube Miniature type used as rf amplifier in low B+ voltage automobile radio receivers operating directly from 12-volt storage-battery sysrequires miniature seven-contact socket. Heatervoltage range (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.19. Characteristics as class A1 amplifier: heater volts, 12.6; plate and grid-No.2

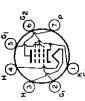
volts, 12.6 (16 max); grid No.3 connected to cathode at socket; grid-No.1 resistor (bypassed), 10 megohms; plate resistance (approx.), 32000 ohms; transconductance, 3800 µmhos; plate ma., 3.2; grid-No.2 ma., 1.4; peak heater-cathode volts, 16 maz. This type is used principally for renewal purposes

MEDIUM-MU TRIODE



storage-battery systems. Outline 8B, OUT-LINES SECTION. Tube requires miniature Miniature type used as combined whf oscillator and mixer in low B+ voltage automobile radio receivers operating directly from 12-volt (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.225. nine-contact socket. Heater-voltage و برا (0)

unit), 0.75 megohm (pentode unit); transconductance, 4700 µmhos (triode unit), 2000 µmhos (pentode unit); plate ma., 2.4 (triode unit), 0.66 (pentode unit); grid-No.2 ma. (pentode unit), 0.28; peak heater-cathode volts, 16 max. This type is used principally for renewal purposes. volts, 12.6 (16 max); grid-No.1 supply volts, 0; grid-No.1 resistor, 4700 ohms (triode unit), 33000 ohms (pentode unit); amplification factor (triode unit), 25; plate resistance (approx.), 6000 ohms (triode Characteristics as class A₁ amplifier: heater volts, 12.6; plate and grid-No.2 (pentode unit)



BEAM POWER TUBE

put amplifier in radio and television Miniature type used as audio-outreceivers employing series-connected heater strings. Outline 13, OUTLINES

seven-contact socket and may be mounted in any position. Heater volts (ac/dc), SECTION. Tube requires miniature 12.6; amperes, 0.45; warm-up time (average), 11 seconds.

CLASS A, AMPLIFIER

Maximum Ralings, (Design-Maximum Values):

PLATE VOLTAGE GRID-NO.2 (SORDEN-GRID) VOLTAGE GRID-NO.2 INVEL PLATE DISSIPATION.

300°max 200°max	125
K Heater Degative with respect to cathode	110
PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to Heater positive with respect to	Typical Operation:

volta

Typical Operation: 110 125 volts 126 volts 1	Heater positive with respect to cathode	200 max	volts
110 125	Typical Operation:		
110 125 -4 -4.5 4 4.5 32 37 31 36 4 11 14000 14000 8100 8500 4500 4500 50 50 1.1 1.5 1.5		125	volts
4 4 5 5 4 5 32 37 31 36 31 36 4 4 5 5 4 5 5 4 5 5 4 5 5 4 5 5 4 5 5 6 6 5 6 5		125	volts
4.5 32 31 31 36 4 4 11 14000 8100 8100 8500 4500 4500 4500 4500 1.1 1.5 1.1 0.5 max		4	volts
32 37 31 36 4 17 8 11 14000 14000 8100 8500 4500 4500 5 5 5 1 1 1 1.5 1 1.5		-4	voits
31 36 4 1 1 4000 14000 8100 8500 4500 4500 5 1.1 1.5 1.1 0.1 max		27	ma
4 11 8 11 14000 14000 8100 8500 4500 4500 5 5 5 1.1 1.5 1.1 0.1 max		98	EE
8 11 14000 14000 81000 8500 4500 4500 5 5 5 1.1 1.5 0.1 max		t-	EUE
14000 14000 8500 4500 5 1.1 1.5 1.1 0.1 max		=	Ē
8100 8500 4500 4500 5 5 5 1.1 1.5		14000	ohrns
4500 4500 5 5 5 1.1 1.5 0.1 max 0.5 max		8200	mpos
1.1 1.5 1.1 1.5 0.1 mox 0.5 mox		4500	ohms
1.1 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5		ro.	per cent
0.1 max 0.5 max		1.5	watte
0.1 mora 0.5 max	Maximum Circuit Values:		
0.5 max			megohm
	For fixed-blas operation		теворш

PENTAGRID AMPLIFIER

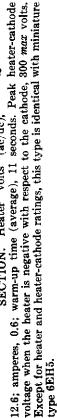
 The dc component must not exceed 200 volts. The dc component must not exceed 100 volts. For cathode-bias operation....

ating directly from 12-volt storage-battery systems. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket, Heatervoltage range (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.15. Characteristics as class A1 am-B+ voltage automobile radio receivers operplifier: heater volts, 12.6; plate and grids-No.2-Miniature type used as rf amplifier in low



6EHS, 25EHS, 50EHS 12EH5 Related types:

Miniature type used in the audio output stage of radio and television heater strings. Outline 7C, OUTLINES receivers employing series-connected SECTION. Heater volts (ac/dc),



REMOTE-CUTOFF PENTODE

in low B+ voltage automobile radio receivers operating directly from 12-volt storage-battery systems. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket. Heater-voltage range (ac/dc), 10 to 15.9; am-Miniature type used as it and rf amplifier peres at 12.6 volts, 0.19. Characteristics as class At amplifier: heater voits, 12.6; plate and grid-No.2 volts, 12.6 (16 max); grid No.3 connected

to cathode at encket; grid-No.1 supply volts, 0 maz; grid-No.1 resistor (bypassed), 2.2 megohms; plate resistance (approx.), 0.05 megohm; transconductance, 4200 mmhos; plate ma., 4; grid-No.2 ma., 1.7; peak heater-cathode volts, 16 maz. This type is used principally for renewal purposes.

= Technical Data



TWIN-DIODE—HIGH-MU TRIODE

from 12-volt storage-battery systems. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket. Heater-voltage Miniature type used as combined detector and audio-amplifier tube in low B+ voltage range (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.15. Characteristics of triode unit as class An automobile-radio receivers operating

tance, 1200 amhos; plate ma., 0.75; cathode ma., 20 mar; peak heater-cathode volts, 30 mar. Maximum (30 max); grid volts, 0; amplification factor, 55; plate resistance (approx.), 45000 ohms; transconducamplifier: heater volts, 12.6; plate volts, 12.6

diode plate ma. (each unit), 1. This type is used principally for renewal purposes.

DIODE—POWER TETRODE

in low B+ voltage automobile-radio receivers Miniature type used as combined detector and driver for transistorized power output stage Heater voltage range (ac/dc), 10.0 to 15.9; amperes (approx.) at 12.6 volts, 0.5. Characoperating directly from 12-volt storage-battery teristics for tetrode unit: plate resistance (approx.), 4000 ohms; transconductance, 5000 systems. Outline 8D, OUTLINES SECTION.

0.5 max watts; peak heater-eathode volts, 30 max. Maximum ratings, tetrode unit: plate ma., 10 max. Tube requires miniature nine-contact socket and may be operated in any position. Type 12EM6 is a μ mhos; plate and grid-No.2 volts, 12.6; grid-No.1 resistor (bypassed), 2.2 megohms; plate ma., 6; grid-No.2 ma., 1. Maximum ratings, tetrode unit: plate and grid-No.2 volts, 30 mar; plate dissipation, DISCONTINUED type listed for reference only.

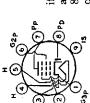


BEAM POWER TUBE

socket. This tube may be supplied with pin Characteristics as class A, amplifier: plate volts, 200; grid-No.2 volts, 110; grid-No.1 volts, -9.5; amplifier tube in television receivers employing series-connected beater strings. Outline 14C, OUTLINES SECTION. Tube requires octal No.1 omitted. Heater volts (ac/dc), 12.6; am-Glass octal type used as vertical-deflectionperes, 0.6; warm-up time (average), 11 seconds.

pulse plate volts, 1200 maz; dc grid-No.2 volts, 150 maz; peak negative-pulse grid-No.1 volts, -250 maz; plate resistance (approx.), 28000 ohms; transconductance, 8000 μ mhos. Maximum ratings as vertical deflection amplifier (for operation in a 525-line, 30-frame system): de plate volts, 300 max; peak positivecathode ma., 175 (peak), 50 (average); plate dissipation, 7 *max* watts; grid-No.2 input, 1.25 *max* watts; peak heater-cathode volts: heater negative with respect to cathode, 300 max (the de component must not exceed 200 volts), heater positive with respect to cathode, 200 max (the de component must not exceed 100 volts). This type is used principally for renewal purposes.





REMOTE-CUTOFF PENTODE

DIODE-

Miniature type used as combined and AM/FM radio receivers. Outline if amplifier and AM detector in AM 8D, OUTLINES SECTION. Tube re-

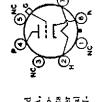
Related types: 6EQ7, 20EQ7

and may be operated in any position. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is identical with miniature type 6EQ7. quires miniature nine-contact socket

HIGH-MU TRIODE

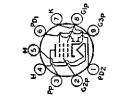
pijed with pin No.1 omitted. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is identical with glass-octal type 675-GT. Type 12F6-GT is a DISCONTINUED type listed for reference only. Glass octal type used in resistance-coupled amplifier circuits of ac /dc receivers. Outline 15A, OUTLINES SECTION. This type may be sup-

> 12F5GT Related type:



REMOTE-CUTOFF PENTODE TWIN DIODE-

from 12-volt storage-battery systems. Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket. Heater-voltage rrange (ac/dc), 10 to 15.3; amperes at 12.6 volts, 0.15. Typical operation of pentode unit as class and at voltage amplifier in low B+ voltage automobile radio receivers operating directly Miniature type used as combined detector At amplifier: heater volts, 12.6; plate and grid-



No.2 volts, 12.6 (30 max); grid No.3 connected to cathode at socket; grid-No.1 volts, 0 max; plate resistance (approx.), 0.33 megohm; transconductance, 1000 µmhos; plate ma., 1; grid-No.2 ma., 0.38; peak heater-cathode volts, 30 maz. Maximum diode plate ma. (each unit), 1. This type is used principally for renewal purposes.

TWIN DIODE-LOW-MU TRIODE

Miniature type used as combined voltage automobile radio receivers operating directly from 12-volt storagebattery systems. Outline 7B, OUTdetector and af amplifier in low B+



LINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position.

volts ampere ಕ್ಷಕ್ಷ Heater Current (Approx.) at 12.6 volts.

Direct Interestably (Approx.) at 12.6 volts.

Direct Interestably (Approx.) at 12.6 volts.

Triode Grid to Triode Plate

Triode Grid to Cathode and Heater

Triode Plate to Cathode and Heater

Triode Plate to Cathode and Heater

Plate of Diode Unit No.1 to Plate of Diode Unit No.2.

0.9

For longest life, it is recommended that the beater be operated within the voltage range of 11 to 14 volts.

						,	,	,	1
									21 92CM-8798T
	10,2			4	4	2/2	1		24 \$2CM
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	1						\mathcal{I}		2
c s	\$137.45°	3						\setminus	~
RIST		8		1			$\langle \ \rangle$	$\backslash \backslash$	
VACTE								M	st volts
AVERAGE CHARACTERISTICS				1				\mathbb{N}	PLATE VOLTS
ERAGE								\prod	_
₹								II_1	
								II	
									_
	TYPE (2FK6 EF=12.6 VOLTS								
	TYPE 12.								
	+		m 53		J.JNM 3T	¥7d			٥

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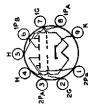
TRIODE UNIT AS CLASS A, AMPLIFIER

were the course of the agon.		
Maximum Ratings, (Design-Center Values):		
PLATE VOLTAGE	16 max	volts
GRID VOLTAGE: Positive-bias value.	0 max	
Negative-bias value	-16 max	volts
Peak Heater-Cathode Voltage: Heater negative with respect to cathode	16 max	volts
Heater positive with respect to cathode	16 max	volts
Characteristics with 12.6 Volts on Heater:		
Plate Voltage.	12.6	volts
Grid-Supply Voltage	⊃ 6⁄ 73	Volt8
(Frid Resiston (Dypassed)	6200	ohme
Transconductance	1200	umpos
Amplification Factor		i
Plate Current	3.4	volts
Maximum Circuit Value:		
Grid-Circuit Resistance	10 max	10 max megohms
DIODE UNITS		
Maximum Rahings, (Design-Center Values): Plate Current (Each unit)	1 max	TO 8

TWIN DIODE-

and at voltage amplifier in low B+ voltage automobile radio receivers operating directly from 12-volt storage-battery systems. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket. Heater-voltage Miniature type used as combined detector MEDIUM-MU TRIODE

range (ac ddc), 10 to 15.9; amperes at 12.6 volts, 0.15. Characteristics of triode unit as class A: 0.15. Characteristics of triode unit as class A: amplifier: heater volts, 12.6; plate volts, 12.6 amplifier: heater volts, 12.6; plate volts, 10.0; plate resistance (approx.), 7700 ohms; transconductance, 1300 ambos; plate ma., 1; peak heater-cathode volts, 30 mar. Maximum diode plate ma. (each unit), 1. This type is used principally for renewal purposes.



TWIN DOUBLE-PLATE TRIODE

divider and complex-wave-generator circuits of electronic musical instru-Miniature type used in frequencyments. Outline 8B, OUTLINES SEC-

may be mounted in any position. Heater volts (ac/dc), 12.6; TION. Tube requires miniature ninecontact socket and

CLASS A, AMPLIFIER

amperes, 0.15.

254) volts	· 1.5 volts			soum nezi	8UU 0.1	
Challacterisms, (Elich 1984). Plate Videave	Grid Voltage	Amplification Factor.	Plate Resistance (Approx.)	Transconductance	Plate Current.	Using either plate A or plate B, with plate not in use connected to ground.

FREQUENCY-DIVIDER AND COMPLEX-WAVE GENERATOR

PEAK HEATER-CATHODE VOLTAGE:

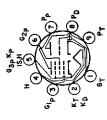
200 max 200°max Heater negative with respect to cathode.

Heater positive with respect to cathode. The de component must not exceed 100 volts.

volts

volts

REMOTE-CUTOFF PENTODE MEDIUM-MU TRIODE— DIODE-



detector in low B+ voltage automobile Miniature type used as combined if amplifier, af amplifier, and second radio receivers operating directly from 12-volt storage-battery systems. Out-

line 8D, OUTLINES SECTION, except vertical dimensions are 3/16 inch shorter. Tube requires miniature nine-contact socket and may be operated in any position. Heater-voltage range (dc), 10 to 15.9; amperes at 12.6 volts, 0.32.

CLASS A, AMPLIFIER

	Triode	Pentode		
Maximum Ratings, (Design-Center Values):	Oust	Unit		
PLATE VOLTAGE.	16 max	16 max	volts	
Cam-No 2 (screen-grd) Supply Voltage.	1	16 max	volts	
GRID-NO.2 VOLTAGE	1	16 max	volts	
PEAR HEATER-CATHODE VOLTAGE:	,		:	
Heater negative with respect to cathode	16 max	1	voits	
Heater positive with respect to cathode	16 max	I	voits	
Characteristics with 12.6 Volts on Heater:				
Plate Voltage	12.6	12.6	volts	
Grid-No.2 Voltage	į	12.6	volts	
Grid-No.1 Voltage	9.0-	8.0-	volt	
Amplification Factor	10	ı		
Plate Resistance (Approx.)	ı	4.0	megohm	
Transconductance	1200	2700	soqua	
Plate Current.	_	1.9	ma	
Grid-No.2 Current	1	7.0	ma	
Grid-No.1 Voltage (Approx.)		,		
for transconductance of 30 µmhos	I	-2.8	volts	
Grid Voltage (Approx.) for plate current of 10 µa	ا ا ا	ı	volts	
 Developed across a 2.2-megohm grid-No.1 resistor. 				
Maximum Circuit Values:				
Grid-No.1-Circuit Resistance	10 max	10 max	10 max megohms	
DIODE UNIT				

Η (S)		ر ا آ] **	25.5	E
WIN TRIODE	used in relay-con-	levision receivers.	NES SECTION.	ture nine-contact	mounted in any

z Z

MEDIUM-MU TI Miniature type u

12FV7	ctrof tuning units of television receivers. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position.	0
HEATER ARRANCEMENT: HEATER VOLTAGR (AC /DG). HEATER CURRENT. ORDER INTERPREDE Grid to Plate. Grid to Catbode and I Plate to Catbode and I	HEATER ARRANGEMENT: 12.6 HEATER VOLTAGE (AC/DC) 12.6 HEATER CURRENT DIRECT INTERRELECTRODE CAPACITANCES (Each Unit, Approx.): Grid to D'aire Grid to Cathode and Heater. Plate to Cathode and Heater.	. :::

CLASS AL AMPUFIER (Each Unit)

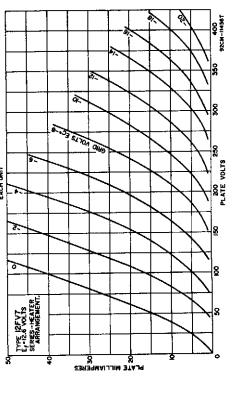
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oo volta	Z volts		Ħ	16 128	10 volts
Plate Voltage	Grid Voltage.	-	Transconductance9600		Grid Voltage (Approx.) for plate current of 100 µa

RELAY CONTROL (Each Unit)

Maximum Ratings, (Design-Maximum Vatues):		,
PLATE VOLTAGE	300 max	volts
GRID VOLTAGE, Positive-bias value	0 max	volts
CATHODE CURRENT.	30 max	8
PLATE DISSIPATION:		
For ON times up to 30 seconds in any 2-minute interval	4.5 max	Watta
For ON times exceeding 30 seconds in any 2-minute interval	2. 6 max	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200 max	volts
Heater positive with respect to cathode	200 max	voits
Typical Operation with 5000-Ohm Relay Load (Each Unit):		
ON Time Up to 30 Seconds in Any 2-Minute Interest		
Plate-Supply Voltage.	270	volts
Zero-Bias Plate Current.		Ħ
Grid Besistor		megohma
Grid Voltage (Approx.) for plate current of 2 ms.	-18	volts
Meximum Circuit Volume		
Grid-Circuit Resistance	89	megohm
The de component must not exceed 100 voits.		

AVERAGE PLATE CHARACTERISTICS EACH UNIT



ш

5 max

10

Tube Voltage Drop for plate current of 2 ma......

PLATE CURRENT.... Maximum Ratings, (Design-Center Values):

Characteristics, Instantaneous Value:

volts

Parallel 6.3

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pr Pr

0.6 5.5

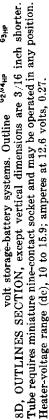
POWER PENTODE

stages of audio amplifiers employing Miniature type used in output series-connected heater strings. Outline 7C, OUTLINES SECTION

12FX5 Related lype: 60FX5

0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 60FX5. Heater volts (ac/dc), 12.6; amperes,

62,64HP rf amplifier and frequency converter in low B+ voltage automobile radio a_{vr}e receivers operating directly from 12-Miniature type used as combined



HEPTODE UNIT AS CONVERTER

MOAIMUM KOINBS, (Liestyn-Cener Futers).	;	ž
PLATE VOLTAGE Grid-No.3 (control-grid) Voltage:	16 max	volts
Negative-bias value Positive-bias value	16 max 0 max	volts volts
Grids-No. 2 and No. 4 (screen grid) Voltage Peak Heater-Cathode Voltage:	16 max	volts
Heater negative with respect to cathode	16 max 16 max	volts

Typical Operation and Characteristics with 12.6 Volts on Heater."		
Plate Voltace	12.6	volts
	-0.5	volt
		volts
	1.6	volts
		ohms
Plate Resistance (Approx.).		megohm
Conversion Transconductance		μmhos
Grid-No.3 Voltage (Approx.) for conversion transconductance of 10 µmhos	က	volts
Plate Current	290	z,
Grids-No.2 and No.4 Current.	1.25	103
Oscillator Characteristics (Not Oscillating).**		
Plate and Grids-No.2 and No.4 Voltage	12.6	volts
Grid-No.3 Voltage	¢	volts
Grid-No.1 Voltage	.	volts
Amplification Factor (between grid No.1 and grids		
No.2 and No.4 connected to plate)	တ	
Transconductance (between grid No.1 and grids		
No.2 and No.4 connected to plate)		ноqши
Cathode Current	4.4	8
Grid-No.1 Voltage (Approx.) for plate current of 10 µa	-4.5	volts
*With grids No.2 and No.4 connected to plate and with 12.5 volts on heater.		

With grids No.2 and No.4 connected to plate and with 12.5 volts on heater.	
Maximum Circuit Valuess 3rid-No.8-Circuit Resistance	10 max megohms
With self-excitation. Developed across a 2.2-megohm grid-No.3 resistor.	

Maximum Circuit Values: Grid-No.3-Circuit Resistance With self-excitation • Developed across a 2.2-megohm grid-No.3 resistor.	10 max no
TRIODE UNIT AS CLASS A, AMPLIFIER Maximum Ratings, (Design-Center Values): PLATE VOLTAGE	16 max
Characteristics with 12.6 Volts on Heater:	,
Piste Voltage Grid Voltage ⁹ .	12.6 -0.8
Amplification Factor.	10 7150
Transconductance Plate further	1400
Grid Voltage (Approx.) for plate current of 10 µa. ^o Developed across a 2.2 megohm grid resistor	3.2

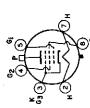
= Technical Data ===

PENTAGRID CONVERTER

ing directly from 12-volt storage-battery systems. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket. Heatervoltage range (ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.15. Typical operation as converter: Miniature type used as converter in low B+ voltage automobile radio receivers operat-

12GA6

heater volts, 12.6; plate and grids-No.2-and-No.4 volts, 12.6; plate and grids-No.2 supply volts, 0 maz; grid-No.3 supply rangelmes, rangelmes, rang grid-No.1 volts, 1.6; grid-No.1 resistor, 33000 ohms; plate resistance (approx), 1 megohms, rangelmes, ranged and plate ma., 0.8; grids-No.2 and-No.4 ma., 0.8; grids-No.2 and-No.4 ma., 0.8; grid-No.1 ma., 0.06; peak heater-cathode volts, 16 mar. This type is used principally for renewal purposes.



BEAM POWER TUBE

Glass octal type used as horizontal-deflection amplifier in television receivers employing series-connected heater strings. Outline 21, OUTLINES SECTION. Tube requires octal socket

and may be operated in any position. Heater volts (ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11 seconds.

			-22.5 volts		4.1	20000 ohms	6600 µmhos		-46 volts		770 max volts	50	-1500 max		1	. 550 max ma		~	4.5 max watts) A	. 220 max °C
CLASS A, AMPLIFIER	Plate Voltage60	Grid-No.2 (Screen-Grid) Voltage	Grid-No.1 (Control-Grid) Voltage	Triode Amplification Factor for	plate and grid-No.2 voltages of 150 volts	Plate Resistance (Approx.)	Transconductance	Plate Current.	Grid-No.1 Voltage (Approx.) for plate current of 1 ma	ror Operation in a section, or frame system. Maximum Ratings, (Design-Maximum Values):	DC PLATE VOLTAGE	VO	PEAK NEGATIVE-PUISE PLATE VOLTAGE	DC GRID-No.2 Voltage	10.1	PEAR CATHODE CURRENT	AVERAGE CATHODE CURRENT.	PLATE DISSIPATION.	GRID-NO.2 INPUT	PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode,	Heater positive with respect to cathode	BULR TEMPERATURE (At hottest point)

* This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds. An adequate bias resistor or other means is required to protect the tube in the absence of excitation.
 The de component must not exceed 100 volts.

^o This value can be measured by a method involving a recurrent waveform such that the maximum ratings will not be exceeded.

Maximum Circuit Values:

volts

ohms ¤mhos volt

volts

2GE5

Related types: 6GES, 17GES

heater strings. Outline 20, OUTLINES Duodecar type used as horizontaldeflection-amplifier tube in television receivers employing series-connected SECTION. Heater volts (ac/dc), 12.6;

amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with duodecar type 6GE5.

BEAM POWER TUBE

2GJ5 Related types: 6GJS, 17GJS

Novar type used in horizontal-de-Outline 18A, OUTflection-amplifier circuits of television receivers employing series-connected LINES SECTION. Tube requires noheater strings.

var nine-contact socket and may be operated in any position. Heater volts (ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with novar type 6GJ5.

SHARP-CUTOFF PENTODE

Miniature type with frame grid used as video amplifier tube in tele-OUTLINES SECTION. Tube requires vision receivers employing series-connected heater strings. Outline 8D

6.3 (series), 12.6 (parallel); amperes, 0.6 (series), 0.3 (parallel); warm-up time miniature nine-contact socket and may be mounted in any position. Heater volts, (average), 11 seconds.

CLASS A: AMPLIFIER

Maximum Ratings, (Design-Maximum Values):

100 max volts 130 max volts See curve page 70 0 max volts 15 max watts	.5 max watts See curve page 70	volts	volts	volts	voits	megohm	ET.	ma volts
400 max 330 max See curr 0 max 7.6 max	1.5 max See cury	200 max 200 max	250	150	. 9č	36000	23	5.7
			. 70	125	D I	1 1	01	, 1 -
PLATE VOLTAGE. GRID-NO.2 (SCREEN-CRID) SUPPLY VOLTAGE. GRID-NO.2 VOLTAGE. GRID-NO.3 (CONTROL-CRID) VOLTAGE, Positive-bias value. PLATE DISSIPATION.	GRID-No.2 Input: For grid-No.2 voltages up to 165 volts. For grid-No.2 voltages between 165 and 330 volts. Park Harres, Cantone Vortages	Heater negative with respect to cathode. Heater positive with respect to cathode.	Characteristics: Dista Simply Voltage	Grid-No.2 Supply Voltage.	Grid-No.1 Voltage Cathode-Bias Resistor	Plate Resistance (Approx.)	Plate Current.	Grid-No.2 Current. Grid-No.1 Voltage (Approx.) for plate current of 100 µa

This value can be measured by a method involving a recurrent waveform such that the maximum The dc component must not exceed 100 volts. ratings of the tube will not be exceeded.

Grid-No.1-Circuit Resistance.

Maximum Circuit Values:

= Technical Data

BEAM POWER TUBE

Novar type used as horizontal-LINES SECTION. Tube requires nodeflection amplifier in television receivers employing series-connected Outline 17A, OUTheater strings.

Related types:

6GTS, 17GTS

var nine-contact socket and may be operated in any position. Heater volts (ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this tube is identical with novar type 6GT5.



BEAM POWER TUBE

Glass octal type used as horizonreceivers employing series-connected tal-deflection amplifier in high-efficiency deflection circuits of television heater strings, Outline 21, OUTLINES

12GW6 6GW6, 17GW6 Related types:

SECTION. Tube requires octal socket and may be operated in any position. Heater volts (ac/dc), 12.6; amperes, 0.6; heater warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with glass octal type 6GW6.



TWIN DIODE

voltage rectifier, or ave tube in ac/de over-all length, 1-3/4 inches; seated height, 1-3/16 inches, diameter, 1-1/32 radio receivers. Maximum dimensions: Metal type used as detector, low-

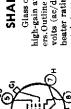
12H6 Related type: inches. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is identical with metal type 6H6.



MEDIUM-MU TRIODE

(ac'dc), 12.6; amperes, 0.15. Except for heater rating and base, this type is identical with glass-octal type 615-GT. Type 12J5-GT is used principally for renewal purposes. Glass octal type used as detector, amplifier, or oscillator in ac/dc radio equipment. Outline 14C, OUTLINES SECTION. This type may be supplied with pin No.1 omitted. Heater volts

12J5G1 Related type:



SHARP-CUTOFF PENTODE

high-gain audio amplifier in ac/dc radio receivers. Outline 15A, OUTLINESSECTION. Heater Glass octal type used as biased detector or volts (ac/dc), 12.6; amperes, 0.15. Except for heater rating, this type is identical with glass-octal type 6J7-GT. Type 12J7-GT is used principally for renewal purposes.

Related type:

TWIN DIODE—POWER TETRODE

Miniature type used as combined detector and audio driver in low $\mathbf{B}+$ voltage automobile

storage-battery systems. Outline 8B, OUT-LINES SECTION. Tube requires miniature

^KD18.D2

0.25 max megohm

radio receivers operating directly from 12-volt

Typical operation of tetrode unit as audio driver: heater volts, 12.6; plate and grid-No.2

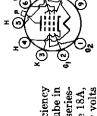
(ac/dc), 10 to 15.9; amperes at 12.6 volts, 0.325

nine-contact socket. Heater-voltage

BEAM POWER TUBE

Related types: 6JB6, 17JB6

Novar type used as high-efficiency horizontal-deflection-amplifier tube in television receivers employing series-OUTLINES SECTION. Heater volts connected heater strings. Outline 18A,



(ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with novar type 6JB6.

POWER TETRODE

systems. Outline 7C, OUTLINES Miniature type used as power amplifier driver in low B+ voltage automobile radio receivers operating directly from 12-volt storage-battery

SECTION. Tube requires miniature seven-contact socket and may be mounted in 12.6 volts, 0.4. Maximum ratings and characteristics are the same as those of the any position. Heater-voltage range (ac/dc), 10.0 to 15.9; amperes (approx.) at tetrode unit of miniature type 12DL8

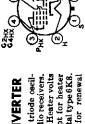
REMOTE-CUTOFF PENTODE

ing avc. Outline 15A, OUTLINES SECTION. Heater volts (ac/dc), 126; amperes, 0.15. Ex-cept for heater ratings, this type is identical with glass octal type 6KV-GT. Type 12KV-GT is Glass octal type used as rf or if amplifier in ac/de radio receivers particularly those employused principally for renewal purposes

2K7G1

Related type:

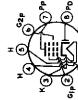
6K7GT



TRIODE—HEXODE CONVERTER

Metal type used as combined triode oscil-ator and hexode mixer in sc/de radio receivers. Outline 4, OUTLINES SECTION. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is identical with metal type 6K8 Type 12K8 is used principally for renewal

Related type:



Miniature type used in combined if-amplifier and AM-detector service

SHARP-CUTOFF PENTODE

DIODE-

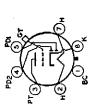
be used as an rf- or if-amplifier or limiter tube; the diode unit may be used for ave or detection. Outline 8D, OUTLINES SECTION. Heater volts (ac/dc), 12.6; amperes, 0.15; warm-up time (average), 17 seconds. Except for heater ratings, this **⊕**. 3 heater strings. Pentode unit may also in AM and AM/FM broadcast receivers employing series-connected type is identical with miniature type 6KL8. Related type: 6K18

BEAM POWER TUBE

Glass octal type used in audio output stages of television receivers employing series-connected heatedstrings. Outline 14C, OUTLINESSEC-IION. This type may be supplied with pin No. 1 omitted. Heater volts (ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11 seconds. Peak heater-cathode volts: heater negative with re-

2516, 2516GT, 5016GT Related types:

NC CG spect to cathode, 300 max; heater positive with respect to cathode, 200 max (the de component must not exceed 100 volts). Except for heater and heater-cathode ratings, this type is identical with giass octal type 50L6-GT. Type 12L6-GT is used principally for renewal purposes.



TWIN DIODE—HIGH-MU TRIODE

amplifier, and avc tube in ac/dc radio receivers. Outline 15A, OUTLINES SECTION Heater Glass octal type used as combined detector, volts (ac/dc), 12.6; amperes, 0.15. Except for heater rating, this type is identical with glass octal type 6Q7-GT. Type 12Q7-GT is used principally for renewal purposes.

BEAM POWER TUBE

heater strings. Outline 7C, OUT-LINESSECTION. Tube requires min-Miniature type used as a vertical deflection amplifier in television receivers employing series-connected ature seven-contact socket and may be mounted in any position.

volts ampere seconds obms	3.3.
12.6 0.6 11 13000 7000	* For plate and grid-No.2 volts, 110; grid-No.1 volts, -8.5, plate ma., 40; grid-No.2 ma., 3.3.
	ma., 40; gi
HEATER VOLTAGE (AC/DC) HEATER CURRENT HEATER CURRENT PLATE RESISTANCE (Approx.)* TRANSCONDUCTANCE*	-8.5, plate
	No.1 volts,
(age)	110; grid-
J/DC) IMB (Avera Approx.)*.	No.2 volts,
OLTAGE (AC URRENT VARM-UP T SISTANCE (A	e and grid-
HEATER V HEATER C HEATER W PLATE RE TRANSCON	* For plate

VERTICAL DEFLECTION AMPLIFIER

For operation in a 525-line, 30-frame system

Maximum Kalings, (Design-Center Vatues);		
DC PLATE VOLTAGE	150 max	volts
PEAR POSITIVE-PULSE PLATE VOLTAGET (Absolute Maximum)	1500 max	volts
GRID-NO.2 (SCREEN-GRID) VOLTAGE	150 max	volts
PEAK NEGATIVE-PULSE GRID-No.1 (CONTROL-GRID) VOLTAGE	-150 max	volts
PEAK CATHODE CURRENT	155 max	ma
AVERAGE CATHODE CURRENT.	45 max	EII
PLATE DISSIPATION	4.5 max	watts
GRID-NO.2 INPUT	1 max	Watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode.	300 max	volts
Heater positive with respect to cathode	200 max	volts
Maximum Circuit Value:		

† The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 39-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds. For cathode-bias operation..... Grid-No.1-Circuit Resistance:

2.2 max megohms

Under no circumstances should this absolute value be exceeded.

The de component must not exceed 100 voits.



Glass octal type used as audio amplifier, TRIPLE DIODE—HIGH-MU TRIODE

AM detector, and FM detector in AM /FM receivers. Outline 15B, OUTLINES SECTION. Heater volts (ac /dc), 12.6; amperes, 0.16. Except for heater ratings, this type is identical with glass octal type 6S8-GT. Type 12S8-GT is a DISCONTINUED type listed for reference

258GI Related type: **658GT**

PENTAGRID CONVERTER

125A7GT Related types:

6SA7, 6SA7GT

types are identical with metal type type 12SA7-GT used as converter in 0.15. Except for heater ratings, these Type 12SA7-GT is used principally Metal type 12SA7 and glass octal Heater volts (ac/dc), 12.6; amperes, ac/de receivers. Outlines 2 and 14C. respectively, OUTLINES SECTION 6SA7 and glass octal type 6SA7-GT or renewal purposes.

HIGH-MU TWIN TRIODE

Metal type used as phase inverter or voltage amplifier in ac/dc radio equipment. Outline 2, OUTLINESSECTION. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is identical with metal type 6SCT. Type 12SC7 is used principally for renewal pur-

HIGH-MU TRIODE

12SF5-GT used in resistance-coupled amplifier circuits of ac /dc radio equipment. Outline 2 and 14C, respectively, OUTLINES SECTION. SSF5-GT, respectively. Type 12SF5-GT is a DISCONTINUED type listed for reference only. Type 12SF5 is used principally for renewal Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, these types are identical metal type 6SF5 and glass octal type Metal type 12SF5 and glass octal purposes with

> **125F5GT** 12SF5

Related types: 6SF5, 6SF5GT

DIODE-REMOTE-CUTOFF PENTODE

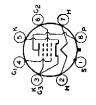
cept for heater ratings, this type is identical with metal type 6SF7. Type 12SF7 is used princi-Metal type used as combined rf or if amplifer and detector or ave tube in ac/de radio receivers. Outline 2, OUTLINES SECTION. Heater volts (ac/dc), 12.6; amperes, 0.15. Expally for renewal purposes.

Related type

SEMIREMOTE-CUTOFF PENTODE

Metal type used as rf amplifier in ac/dc receivers involving high-frequency, wide-band applications. Outline 2, OUTLINES SECTION. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is identical with metal type 6SG7. Type 12SG7 is used principally for renewal purposes.

> **25G7** Related type:



SHARP-CUTOFF PENTODE

=== Technical Data ==

receivers involving high-frequency, wide-band applications and as limiter tube in FM equipheater ratings, this type is identical with metal type 6SH7. Type 12SH7 is used principally for Metal type used as rf amplifier in ac/dc ment. Outline 3, OUTLINES SECTION. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for renewal purposes.

Related lype:

SHARP-CUTOFF PENTODE

type 12SJ7-GT used as rf amplifiers and biased detectors in ac/dc radio receivers. Outline 2 and 14C, respec-Metal type 12SJ7 and glass-octal tively, OUTLINES SECTION

|25K7G| 12SJ7GT Related types: 65J7, 65J7GT

Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, these types are identical with metal type 6SJ7 and glass-octal type 6SJ7-GT. Type 12SJ7-GT is a DISCONTINUED type listed for reference only.

REMOTE-CUTOFF PENTODE

LINES SECTION. Heater volts Metal type 12SK7 and glass octal type 12SK7-GT used as rf and if amplifiers in ac/dc radio receivers. Outlines 2 and 14C, respectively, OUT-

(ac/dc), 12.6; amperes, 0.15. Except for heater ratings, these types are identical with metal type 6SK7 and glass octal type 6SK7-GT. Type 12SK7-GT is used principally for renewal purposes. S125K7 BC125K7-6T

HIGH-MU TWIN TRIODE

Glass octal type used as phase inverter or resistance-coupled amplifier in ac/dc radio equipment. Outline 14C, OUTLINES SECTION. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater rating, this type is identical with glass octal type 6SL7-GT.

65K7, 75K7GT Related types:

MEDIUM-MU TWIN TRIODE

12SNZGT

Glass octal types used as combined 125N7GTA vertical oscillators and vertical deflecers. May also be used in multivibrator flection oscillators in television receivtion amplifiers, and as horizontal de-

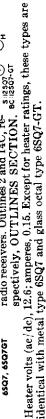
Related type: **6527018**

these types are identical with glass octal types 6SN7-GT and 6SN7-GTB, respectively. Type 12SN7-GT is a DISCONTINUED type listed for reference only. or resistance-coupled amplifier circuits in radio receivers. Outline 14C, OUTLINES SECTION. Heater volts (ac/dc), 12.6; amperes, 0.3. Except for heater ratings,

TWIN DIODE-HIGH-MU TRIODE

25Q7GT 65Q7, 65Q7GT

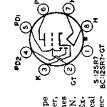
tector, amplifier, and ave tube in ac/de radio receivers. Outlines 2 and 14C, retype 12SQ7-GT used as combined de-Metal type 12SQ7 and glass octal



MEDIUM-MU TRIODE TWIN DIODE-

with type 6SR7, and type 12SR7-GT is elecand ave tube in ac/de radio receivers. Outlines 2and14C, respectively, OUTLINESSECTION. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater rating, type 12SR7 is identical trically identical with type 6SR7 except for in-12SR7-GT used as combined detector, amplifier, Metal type 12SR7 and glass octal

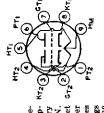
> 125R7GT Related types: 6SR7, 6SR7GT



principally for renewal purposes. The 12SR7-GT is a DISCONTINUED type listed for reference only. terelectrode capacitances. Type 12SR7 is used

MEDIUM-MU TWIN TRIODE

Tube requires miniature nine-contact socket 672(2 and may be mounted in any position. Heater voltage range (ac/dc), 10.0 to 15.9; amperes amplifier tube in automobile-radio receivers operating directly from 12-volt storage-battery systems. Outline 8B, OUTLINES SECTION. Miniature type used as general-purpose-(approx.) at 12.6 volts, 0.15. Maximum ratings

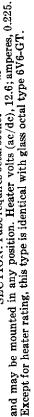


max; cathode ma., 15 max; peak heater-cathode volts, 30 max. This type is used principally for tenewal (each unit) as class At amplifier: plate volts, 30

BEAM POWER TUBE

SV6GT, 6V6GT

age battery. Outline 14C, OUTLINES amplifier primarily in automobile radio receivers operating from a 12-volt stor-SECTION. Tube requires octal socket Glass octal type used as output



BEAM POWER TUBE

Glass octal type used in the audio output stages of television receivers employing series-connected heater strings. Triode-connected, this type is used as a vertical deflection amplifier. Outline

Heater volts (ac/dc), 12.6; amperes, 0.6; warm-up time (average), 11 seconds. Peak heater-cathode volts: heater negative with respect to cathode, 300 max (the 200 max (the dc component must not exceed 100 volts). Except for heater and de component must not exceed 200 volts); heater positive with respect to eathode. 14C, OUTLINES SECTION. This type may be supplied with pin No.1 omitted heater-cathode ratings, this type is identical with glass octal type 6W6-GT

FULL-WAVE VACUUM RECTIFIER

= Technical Data =

supply of automobile radio receivers tery. Outline 7C, OUTLINES SEC-Miniature type used in power operating from a 12-volt storage bat-TION. Heater volts (ac/dc), 12.6; am-

Related type

peres, 0.3. Except for heater ratings, this type is identical with miniature type $6\mathrm{X}4$.

HALF-WAVE VACUUM RECTIFIER

peak inverse plate volts, 700 max; peak plate Glass types used in power supply of ac/de receivers. Maximum dimensions: over-all length, 4-3/16 inches; seated beight, 3-9/16 inches; diameter, 1-9/16 inches. Tube requires four-contact socket. Heater volts (ac/dc), 12,6; amperes, 0.3. Maximum ratings as half-wave rectifier: heater-cathode volts, 350 max. This is a DIS-CONTINUED type listed for reference only. ma., 330 max; de output ma., 55 max;



HIGH-MU TRIODE

Heater volts (ac/dc), 13.5; amperes, 0.06. Except for heater ratings, this type Nuvistor type used in booster amplifiers of antenna systems serving multiple television receiver installations. Outline 1, OUTLINES SECTION. is identical with nuvistor type 6CW4 INDEX*LARGE LUG



DUAL TRIODE

vertical-deflection-oscillator and vernected heater strings. Unit No.1 is a Miniature type used as combined tical-deflection-amplifier tube in television receivers employing series-con-

⊕ ,472

Related types: **6ED7, 10DE7** medium-mu triode unit used as a blocking oscillator in vertical-deflection circuits, and unit No.2 is a low-mu triode unit used as a vertical-deflection amplifier. Outline 8D, OUTLINES SECTION. Heater volts (ac/dc), 13; amperes, 0.45; warmup time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6DE7.



DUAL TRIODE

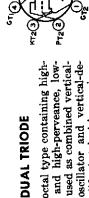
Miniature type containing highmu and low-mu triodes; used as combined vertical-deflection-oscillator and television receivers. Outline 8D, OUTvertical-deflection-amplifier tube

3DR7

erated in any position. Heater volts (ac/dc), 13; amperes, 0.45; warm-up time LINES SECTION. Tube requires miniature nine-contact socket and may be op-(average), 11 seconds. Except for heater ratings, this type is identical with type 6DR7.

Related types: 6EM7, 10EM7 **13EM7**

deflection oscillator and vertical-demu triode and high-perveance, lowflection amplifier in television receivers Glass octal type containing highmu triode; used as combined vertical-

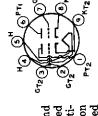


Heater volts (ac/dc), 13; amperes, 0.45; warm-up time (average), 11 seconds. employing series-connected heater strings. Outline 14B, OUTLINES SECTION Except for heater ratings, this type is identical with type 6EM7.

DUAL TRIODE

Related type: **6**F07

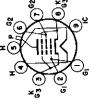
Glass type containing high-mu and low-mu triode units used as combined cal-deflection amplifier in television receivers employing series-connected vertical-deflection oscillator and verti-



heater strings. Heater volts (ac/dc), 13; amperes, 0.45; warm-up time(average), 11 seconds. Except for heater ratings, this type is identical with glass type 6FD7.

BEAM POWER TUBE

Neonoval type used as horizontaldeflection amplifier in television receivers. Maximum dimensions: overall length, 4-7/64 inches; seated height, 3-49/64 inches; diameter, 1-3/16 in.



Heater volts (ac/dc), 13.3; amperes, 0.6. Typical instantaneous characteristics (measured with recurrent waveform such that maximum ratings are not exceeded): plate volts, 75; grid-No.2 volts, 200; grid-No.1 volts, -10; plate ma., 440; grid-No.2 Tube requires neonoval nine-contact socket and may be mounted in any position.

HORIZONTAL DEFLECTION AMPLIFIER

For operation in a 525-line, 30-frame system

DC Drans Voinage	275 max	volts
•	7700 max	volts
	275 max	volts
	275 max	ma
PLATE DESIRATION.	17 max	watts
GRUP-No.2 Input	6 max	watts
	250°max 250°max	volts volts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance: With drive into grid current (horizontal-deflection applications only) With one wid current	2.2 max megohms 0.5 max megohm	negohms megohm

■The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

The de component must not exceed 125 volts.

DUAL TRIODE

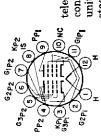
6GF7, 10GF7

and high-perveance, low-mu triode tion amplifier and vertical-deflection

units used as combined vertical-deflec-

Novar type containing high-mu

ploying series-connected heater strings. Outline 10A, OUTLINESSECTION. Heater volts (ac/dc), 13; amperes, 0.45; warm-up time (average), 11 seconds. Except for oscillator in television receivers emheater ratings, this type is identical with novar type 6GF7.



BEAM POWER TUBE POWER PENTODE-

Duodecar type used in FM and television receivers employing series-

applications. Outline 12B, OUTLINES SECTION. Tube requires duodecar used as a gated-beam discriminator in FM and television limiter and discriminator twelve-contact socket and may be mounted in any position. Heater volts (ac/dc), connected heater strings. The pentode unit is used in audio power-output stages, and the beam power unit is 13.2; amperes, 0.45; warm-up time (average), 11 seconds.

PENTODE UNIT AS CLASS A1 AMPLIFIER		
Maximum Ratings, (Design-Maximum Values):		
PLATE VOLTAGE	275 max	
	275 max	volts
PLATE DISSIPATION	10 mar	
GRID-NO.2 INPUT.	2 max	watts
PEAK HEATER-CATHODE VOLIAGE:	200 200	volts
Heater negative with respect to cathode	200 max	volts
Acade positive with respect to contract		
Characteristics and Typical Operation:		
Plate Voltage	250	volts
Crid-No.2 Voltage	250	voits
Grid-No.1 Voltage	œ l	volts
Peak AF Grid-No 1 Voltage	æ	volts
Plate Registance (Anntox.)	0.1	megohm
Transconductance	6500	soum
Zero-Signal Plate Current.	35	ma
Maximum-Signal Plate Current.	33	ma
Zero-Signal Grid-No.2 Current.	2.5	ma
Maximum-Signal Grid-No.2 Current.	2	TD3
Load Resistance	2000	ohms
Distortion (Approx.)	10	per cent
Maximum-Signal Power Output.	4.	watts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance:		
For fixed-bias operation	· 0.25 mar	
For eathode-bias operation	0 5 max	тедонш
BEAM POWER UNIT AS GATED-BEAM DISCRIMINATOR	×	
Maximum Ratinas. (Design-Maximum Values):		
PLATE SUPPLY VOLTAGE	330 max	volts

60 max 13 max 200 max 200 max	60 max 13 max 200 max 200 max	Mackindm Katings, (Debign-jrazeman v deves). Plate Supply Vollyage. Centan 0 (come memos feet) Voltages	330 max 110 max	volts
200 max 200 max	200 max 200¶max	PARA POSITION OF THE STATE OF T	60 max 13 max	A E
	onent must not exceed 100 volts.	PBAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode	200 max 200 max	volts volts

Glass lock-in type used as detector, amplifier, or oscillator in ac/de radio receivers. Outline 13A, OUTLINES SECTION. Tuberequires tances, this type is electrically identical with lock-in type 7A4 and metal type 6J5. Type 14A4 is a DISCONTINUED type listed for lock-in socket. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater rating and capacreference only

BEAM POWER TUBE

volts and ratings as class A₁ amplifier: plate volts and grid-No.2 volts, 250 (300 max); plate dissipation, 7.5 watts; grid-No.2 input, 1.5 watts; grid-No.1 volts, -12.5; plate ma., 32; Glasslock-in type used as output amplifier in ac /dcradio receivers. Outline 13A, OUTLINES SECTION. Tube requires lock-in socket. Heater volts (ac/dc), 12.6; amperes, 0.15. Typical op-

grid-No.2 ma., 5.5; plate resistance, 70000 ohms; transconductance, 3000 µmhos; load resistance, 7500 ohms; output watts, 2.8. This is a DISCONTINUED type listed for reference only.

REMOTE-CUTOFF PENTODE

Glasslock-in type used as rf or if amplifier in ac/de radio receivers. Outline 13A, OUTLINES SECTION. Tube requires lock-in socket. Heater beater rating and capacitances, this type is electrically identical with metal type 68K7 and lock-in type 7A7. Type 14A7 is used principally volts (ac/dc), 12.6; amperes, 0.15. Except for for renewal purposes.

Glass lock-in type used as voltage amplifier or phase inverter in radio equipment. Outline 13A, OUTLINES SECTION. Tube requires ock-in socket. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is electrically identical with lock-in type TAFT. Type 14AF7 is used principally for renewal pur-MEDIUM-MU TWIN TRIODE

TWIN DIODE—HIGH-MU TRIODE

Glass lock-in type used as combined detector, amplifier, and ave tube in ac/de radio receivers. Outline 18A, OUTLINES SECTION. rating and capacitances, this type is electrically identical with lock-in type 7B6 and metal type Tube requires lock-in socket. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater 6SQ7. Type 14B6 is used principally for renewal

heater rating and capacitances, this type is electrically identical with lock-in type 7B8 and metal type 6A8. Type 14B8 is a DISCONTIN-UED type listed for reference only. Glass lock-in type used as converter in ac/dc radio receivers. Outline 13A, OUTLINES SECTION, Tube requires lock-in socket. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for PENTAGRID CONVERTER

= Technical Data =

BEAM POWER TUBE

in ac/dc radio receivers. Outline 13B, OUT-LINES SECTION. Tube requires lock-in socket. Heater volts (ac/dc), 12.6; amperes, 0.225. Except for heater ratings, this type is electrically identical with lock-in type 7C5 and Glass lock-in type used as output amplifier metal type 6V6. Type 14C5 is a DISCON-TINUED type listed for reference only.

14C5

SHARP-CUTOFF PENTODE

biased detector in ac/de radio receivers. Outline 13A, OUTLINES SECTION. Tube requires ratings as class A. amplifier: plate volta, 250 (300 max); grid-No.2 volts, 100; plate dis-Glass lock-in type used as rf amplifier and lock-in socket. Heater volts (ac/de), 12.6; amperes, 0.15. Typical operation and maximum

max watt; grid No.1 volts, -3; grid No.3 connected to cathode at socket; plate resistance, greater than 1 megohm; transconductance, 1575 μmhos; plate ma., 2.2; grid-No.2 ma., 0.7. Within the limits of its maximum ratings, this type is similar in performance to metal types 63J7 and 12SJ7. Type 14C7 is used sipation, 1 max watt; grid-No.2 input, 0.1 principally for renewal purposes.

TWIN DIODE-MEDIUM-MU TRIODE

tector, amplifier, and ave tube in ac/de radio receivers. Outline 13A, OUTLINES SECTION. lube requires lock-in socket. Heater volts, (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is electrically identical with lock-in type TE6 and miniature type 6BF6. Type 14E6 is a DISCONTINUED type listed Glass lock-in type used as combined defor reference only.

14E6

TWIN DIODE—REMOTE-CUTOFF PENTODE

Tube requires lock-in socket. Heater volts (ac/dc), 12 5; amperes, 0.15. Except for heater ratings, this type is electrically identical with Glass lock-in type used as combined detector, amplifier, and ave tube in ac/de relock-in type 7E7. Type 14E7 is a DISCONceivers. Outline 13A, OUTLINES SECTION TINUED type listed for reference only.

HIGH-MU TWIN TRIODE

or resistance-coupled amplifier in ac/dc radio receivers. Outline 13A, OUTLINES SECTION. lube requires lock-in socket. Heater volts Glass lock-in type used as phase inverter (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is electrically identical with lock-in type 7F7 and glass-octal type 6SL7-GT. Type 14F7 is used principally for renewal purposes.

MEDIUM-MU TWIN TRIODE

oscillator in ac /dcradio equipment. Outline 13A, OUTLINES SECTION, except over-all length is 2-9/32 max inches and seated length is 1-3/4 inches. Tube requires lock-in socket. Heater volts (ac/dc), 12.5; amperes, 0.15. Except for heater ratings, this type is electrically identical with lock-in type 7FS. Type 14FS is used Glass lock-in type used as amplifier principally for renewal purposes.

Miniature type used as combined detector and af voltage amplifier in radio receivers. Outline 8B, OUT-LINES SECTION. Tube requires miniature nine-contact socket and may be operated in any position.



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•	volt amper	uho
7	0.15	72000

1000

albatem current Ampliegation Factors' Plate Resitance (Approx.)'' Transconductance' For triode unit; plate volts, 250; grid volts, -3; plate ma., 0.7.

HEATER VOLTAGE (AC/DC)... HEATER CURRENT....

ohms umbos

TRIODE UNIT AS CLASS A, AMPLIFIER

DIODE UNITS (Each Unit)

;	2 маж		200-max
Maximum Ratings, (Design-Maximum Values):	PLATE CURRENT.	FEAK HEATER-CATHOUS VOLIAGE: Heater negative with respect to cathode	Heater positive with respect to cathode.

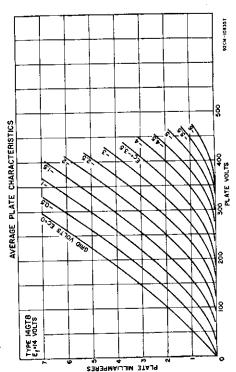
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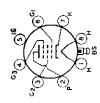
Characteristics, Instantaneous Value:

Tube Voltage Drop for plate current of 18 ma..... The dc component must not exceed 100 volts.



SEMIREMOTE-CUTOFF PENTODE

in acide radio receivers. Outline 13A, OUT-LINES SECTION. Tube requires lock-in snoket. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is electrically identical with type 7.Hr. Type 14HT is a DISCONTINUED type listed for reference only. Glass lock-in type used as of or if amplifier



= Technical Data =

TRIODE—HEPTODE CONVERTER

ratings, this type is electrically identical with lock-in type 717. Type 1417 is a DISCONTINUED type listed for reference only. Glass lock-in type used as combined triode oscillator and heptode mixer in ac/de radio receivers. Outline 134, OUTLINES SECTION. Tube requires lock-in socket. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater

14.17

MEDIUM-MU TWIN TRIODE

amperes, 0.3. Except for heater ratings and experiences, this type is electrically identical with lock-in type 7NT and glass-octal type 6SN7-GT. Type 14N7 is a DISCONTINUED Glass lock-in type used as voltage amplifier or phase in verter in ac/dc radio equipment. Outline 13B, OUTLINES SECTION. Tube requires lock-in socket. Heater volts (ac/dc), 12.6; type listed for reference only.

PENTAGRID CONVERTER

<u>a</u>(4

voits voits watts

330 max 0 max 1.1 max

volts volts

200 max 200 max

Glass lock-in type used as converter in ac/dc radio receivers. Outline 13A, OUTLINES SECTION. Tube requires lock-in socket. Heater electrically identical with metal type 6SA7 and lock-in type 7Q7. Type 14Q7 is used principally for renewal purposes. volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings and capacitances, this type is

REMOTE-CUTOFF PENTODE TWIN DIODE-

tector, amplifier, and ave tube in ac/de radio receivers. Outline 13A, OUTLINES SECTION. Glass lock-in type used as combined de-Tube requires lock-in socket. Heater volts (ac/dc), 12.6; amperes, 0.15. Except for heater ratings, this type is electrically identical with lock-in type 7R7. Type 14R7 is used principally for renewal purposes.

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SHARP-CUTOFF PENTODE

operated receivers. Outline 24B, OUTLINES SECTION. Tube requires five-contact socket. operation as class A1 amplifier: plate volts, 135 maz; grid-No.2 (screen.grid) volts, 67.5 maz; grid-No.1 volts, -1.5; plate ma., 1.85; grid-No.2 ma., 0.3; plate resistance, 0.80 megohm; transconductance, 750 µmhos. This is a DISCON-TINUED type listed for reference only. Glass type used as rf amplifier in battery-Heater voits (dc), 2.0; amperes, 0.22. Typical

SHARP-CUTOFF PENTODE DUAL TRIODE—

5

strings. The high-mu triode unit is used in agc-keyer applications, the low-mu of applications in television receivers employing series-connected heater Duodecar type used in a variety **©**5

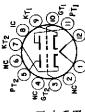
2

triode unit in sync-separator applications, and the pentode unit in video-amplifier applications. Outline 12C, OUTLINES SECTION. Heater volts (ac/dc), 14.7; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with duodecar type 6AF11.

DUAL TRIODE

Related type: **6FY7**

No.1 is used as an oscillator, and the low-mu triode unit No.2 is used as an ampli-0,45; warm-up time (average), 11 seconds. Except for heater ratings, this type is fier. Outline 12D, OUTLINES SECTION. Heater volts (ac/dc), 14.7; amperes, receivers employing series-connected heater strings. The high-mu triode unit Duodecar type used as combined vertical-deflection oscillator and vertical-deflection amplifier in television



POWER PENTODE

identical with duodecar type 6FY7.

15HB6 Related type: 6HB6

Miniature type used as vertical receivers. Outline 8E, OUTLINES deflection-amplifier tube in television SECTION. Heater volts (ac/dc), 14.7; amperes, 0.3; warm-up time (average),

<u>(0</u>

11 seconds. Except for heater ratings, this type is identical with miniature type 6HB6.

BEAM POWER TUBE HIGH-MU TRIODE-

deflection-amplifier applications in black-and-white television receivers having low-voltage "B" supplies and tical-deflection-oscillator and vertical-Novar type used in combined ver-

employing series-connected heater strings. Outline 10C, OUTLINES SECTION. Tube requires novar nine-contact socket and may be mounted in any position. Volts

HEARER VOLTAGE (AC (DC)	7	875
Landana Cristana	0.45	ampere
HEATER WARM-UP TIME (Average)	01	seconds
DIRECT INTERELECTRODE CAPACITANCES (Approx.): Triode Unit:		
Grid to Plate	0.44	д
Grid to Cathode and Heater	35	Ħ.
Plate to Cathode and Heater	:-	jd.
Pentode Unit:	4	•
Grid No.1 to Plate	0.048	Þ.
Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3	2.6	ቯ
Plate to Cathode, Heater, Grid No.2, and Grid No.3.	0.28	ď
CLASS A. AMPLIFIER		

VERTICAL DEFLECTION OSCILLATOR AND AMPLIFIER For operation in a 525-line, 30-frame system

Triode	Triode Beam Power
Unit	Unit
Oscillator	Amplifier
330 max	300 max
1	$2200 \mid max$
1	150 max
ı	

volts volts

= Technical Data

Peak Negative-Pulse Grid-No.1 Voltage	-400 max	-250 max	volts
PRAK CATHODE CURRENT.	22 max	200 max	ma
AVERAGE CATHODE CURRENT.	22 max	60 max	ma
PLATE DISSIPATION.	1.5 max	12 max	watts
GRID-No.2 Input	1	1.9 max	watts
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	200 max	200 max	volts
Heater positive with respect to cathode	200 max	200 -max	volts
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance:	,	ć	-
For grid-resistor-bias operation	z. z max	z.z max megonms	regonms

* Triode connection, grid No.2 connected to plate at socket.

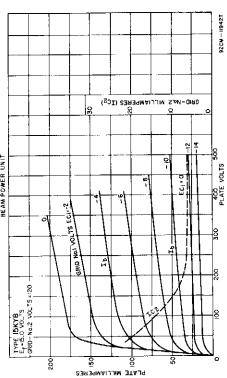
• This value can be measured by a method involving a recurrent waveform such that the maximum

The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

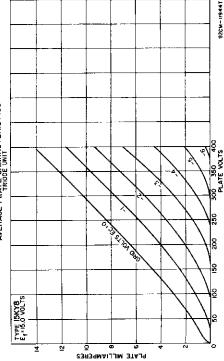
† Under no conditions should this maximum value be exceeded.

The dc component must not exceed 100 volts. ratings of the tube will not be exceeded.

AVERAGE CHARACTERISTICS BEAM POWER UNIT



AVERAGE PLATE CHARACTERISTICS TRIODE UNIT



volts volts volts

Unit 120 -10

Beam Power

Triode Unit

ohms anhos

18000

40000

Plate Resistance (Approx.).....

Amplification Factor...

Grid-No.2 (Screen-Grid) Voltage Grid-No.1 (Control-Grid) Voltage

Characteristics:

Grid-No.2 Current. Grid-No.1 Voltage (Approx.) for plate current of 1 ma Transconductance

Plate Current.

	DIODE		_ ن
16AQ3			© © ⊇
and may be mount	requires miniature hine-contact socket and may be mounted in any position. Heater volts (ac/dc), 16.4; amperes, 0.6.	.4; amperes, 0	.6.
Maximum Ralings, (Design-Center Values):	esign-Center Values):	550 max	volts
SUPPLY VOLTAGE at Zer	Supply Voltage at zero current.	250 max	voits
SUPPLY VOLTAGE PRAK PLATE CURRENT.	SUPPLY VOLIAGE PRAK PLATE CURRENT	550 max	E E
AVERAGE PLATE CURRE	AVERAGE PLATE CURRENT	5 max	watts
PLATE DISSIPATION PEAK NEGATIVE-PULSE	PLATE DISSIPATION PLATE VOLTAGE	-6000 max	volts
PEAK HEATER-CATHODE VOLTAGE:	AK HEATER-CATHODE VOLTAGE:	6600°max	volts

HALF-WAVE VACUUM RECTIFIER

Under no conditions should an absolute maximum value of 7500 volts he exceeded.
 The pulse duration must not exceed 22 per cent of a cycle, or a maximum of 18 microseconds.

17AX3

6AX3, 12AX3

tube in horizontal-deflection circuits connected heater strings. Outline 12C, OUTLINES SECTION. Heater volts Duodecar type used as damper of television receivers employing series-

9

(ac/dc), 16.8; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with duodecar type 6AX3

Glass octal types used as damper HALF-WAVE VACUUM RECTIFIER tubes in horizontal deflection circuits of 17AX4GTA 17AX4GT

television receivers employing seriesconnected heater strings. Outline 14C, Related types: 6AX4GT, 6AX4GTB, 12AX4GTA, 12AX4GTB,

(ac/dc), 16.8; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater OUTLINES SECTION. Heater volts 25AX4GT

ratings, these types are identical with glass octal types 6AX4-GT and 6AX4-GTB, respectively.

Novar type used as damper tube in

horizontal-deflection circuits of blackand-white television receivers employ-

ing series-connected heater strings.

Outline 17A, OUTLINES SECTION

HALF-WAVE VACUUM RECTIFIER

Related types: 6AY3, 12AY3 Heater volts (ac/dc), 16.8; amperes, 0.45; warm-up time (average), 11 seconds.

Except for heater ratings, this type is identical with novar type 6AY3.

and-white television receivers employ-HALF-WAVE VACUUM RECTIFIER Novar type used as damper tube in horizontal-deflection circuits of blacking series-connected heater strings. Outline 17A, OUTLINES SECTION.

> 1**7BH**3 Related types:

6BH3, 22BH3

Heater volts (ac/dc), 17.0; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with novar type 6BH3.

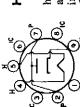
= Technical Data =

BEAM POWER TUBE

Glass octal type used as horizon-17BQ6GTB receivers employing series-connected tal deflection amplifier in television heater strings. Outline 15C, OUT-LINES SECTION. Heater volts (ac/

6BQ6GTB/6CU6, 125Q6-GTB/12CU6, 25BQ6GTB/

0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with glass octal type 6BQ6-GTB/6CU6. dc), 16.8; amperes,



volts volts

6600°max 6600°max

HALF-WAVE VACUUM RECTIFIER

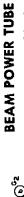
Novar type used as damper tube in horizontal-deflection circuits of blackand-white television receivers employing series-connected heater strings, Outline 10D, OUTLINES SECTION

Related lypes: 6853, 12BS3 Heater volts (ac/dc), 16.8; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with novar type 6BS3.

SHARP-CUTOFF DUAL TETRODE

Heatexcept for heater ratings, this type is identical with miniature type 6C9. Miniature type used as vhf rf-amplifier and autodyne mixer tube. Outer volts (ac/dc), 16.8; amperes, 0.15. line 8B, OUTLINES SECTION. 1

Related type:



Miniature type used in the audio output stage of television receivers employing series-connected heater strings. Outline 7C, OUTLINES SECTION.

0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is scus, 12cus/12cs Heater volts (ac/dc), 16.8; amperes,

identical with miniature type 6CU5.



HALF-WAVE VACUUM RECTIFIER

connected heater strings. Outline 14C, OUTLINES SECTION. Heater volts tube in horizontal-deflection circuits Glass octal type used as damper of television receivers employing series-

Related type: 6DA4

(ac/dc), 16.8; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with glass octal type 6DA4. 423



HALF-WAVE VACUUM RECTIFIER

7DE4

Related types: 6DE4, 22DE4

television receivers employing series-OUTLINES SECTION. Heater volts tube in horizontal-deflection circuits of connected heater strings. Outline 14F, Glass octal type used as damper

(ac/dc), 17; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with glass octal type 6DE4.

HALF-WAVE VACUUM RECTIFIER

7DM4

Related lypes: 6DM4, 12DM4

OUTLINES SECTION. Heater volts television receivers employing seriesconnected heater strings. Outline 14F, Glass octal type used as damper tube in horizontal-deflection circuits of

seconds. Except for heater ratings, this type is identical with glass octal type 6DM 4. (ac/dc), 16.8; amperes, 0.45; warm-up time (average), 11

7DQ6A

BEAM POWER TUBE

7DQ6B Related types: 6DQ6A, 6DQ68,

12DQ6A, 12DQ6B

heater strings. Outline 21, OUTLINES tal deflection amplifier in television receivers employing series-connected Glass octal types used as horizon-

amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, these types are identical with glass octal types 6DQ6-A and 6DQ6-B.

BEAM POWER TUBE

7GE5 Related types:

6GE5, 12GE5

Duodecar type used as horizontalheater strings. Outline 20, OUTLINES SECTION. Heater volts (ac/dc), 16.8; deflection-amplifier tube in television receivers employing series-connected

amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with duodecar type 6GE5.

BEAM POWER TUBE

6615, 12615

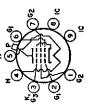
heaterstrings.Outline18A,OUTLINES flection-amplifier circuits of television receivers employing series-connected SECTION. Tube requires novar nine-Novar type used in horizontal-de-

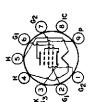
contact socket and may be operated in any position. Heater volts (ac/dc), 16.8; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with type 6GJ5.

BEAM POWER TUBE

7G15 Related types: 6GTS, 12GTS

Novar type used in horizontal-deheater strings. Outlines 17A, OUTflection-amplifier circuits of television receivers employing series-connected LINES SECTION. Tube requires no-





= Technical Data =

var nine-contact socket and may be operated in any position. Heater volts (ac/dc), 16.8; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this tube is identical with novar type 6GT5.

BEAM POWER TUBE

Duodecar type used as horizontaldeflection-amplifier tube in television receivers employing series-connected heater strings. Outline 16C, OUT-LINES SECTION. Heater volts (ac

BEAM POWER TUBE

Except for heater

de), 16.8; amperes, 0.45; warm-up time (average), 11 seconds.

ratings, this type is identical with duodecar type 6GV5.

9₩9∠ 6GW6, 12GW6 tal-deflection-amplifier circuits of highvision receivers employing series-con-Glass octal type used in horizonefficiency deflection circuits of tele-

sition. Heater volts (ac/dc), 16.8; amperes, 0.45; warm-up time (average), 11 LINES SECTION. Tube requires octal socket and may be operated in any poseconds. Except for heater ratings, this type is identical with glass octal type 6GW6.

nected heater strings. Outline 21, OUT-



Novar type used as high-efficiency horizontal-deflection-amplifier tube in television receivers employing series-OUTLINES SECTION. Heater volts connected heater strings. Outline 18A.

Related types: 6JB6, 12JB6 (ac/dc), 16.8; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with novar type 6JB6.

MEDIUM-MU TRIODE— POWER PENTODE

vision receivers employing series-con-Duodecar type used as combined vertical-deflection-oscillator and vertical-deflection-amplifier tube in tele-و ق

OUTLINES SECTION. Tube requires duodecar twelve-contact socket and may be mounted in any position. Heater volts (ac/dc), 16.8; amperes, 0.45; warm-up time nected heater strings. Outline 12B average), 11 seconds.

CLASS A' AMPLIFIER		
i		
Characteristics:	Unit Unit	
Plate Voltage.	150 45 120	volts
Grid-No.2 (Screen-Grid) Voltage.	- 110 110	volts
Grid-No.1 (Control-Grid) Voltage	25	voits
Amplification Factor	21.5	
Plate Resistance (Approx.)	11300 - 11700	ohma
Transconductance		mhos
Plate Current.	122	an.
Grid-No.2 Current		E III
Grid-No.1 Voltage (Approx.) for plate current of 100 µa	25	volts
Grid-No.1 Voltage (Approx.) for plate current of 10 µa	-1.0	volts

volts volts

VERTICAL-DEFLECTION OSCILLATOR AND AMPLIFIER

	Per
system	Triode
line, 30-frame sy.	
on in a 525-line, 3	
For overation	
J.	

10) NECESSARY OF THE PROPERTY			
•	Triode	Pentode	
	Unit	Unit	
Maximum Ratings. (Design-Maximum Values):	Oscillator	Ampli her	
	250 max	250 max	vol
DO LEATE VOLIAGE Dec. 7. Booms up Drit on Prace Voltages.	1	2000 max	vol
Character Colliner Character Colliner Colliner No. 9 Voltaker	1	200 max	VO
DEAN NEGATIVE PHISE CRID-NO.1 VOLTAGE	· 400 max	$-150 \ max$	lov
PRAY CATHODE CURRENT.	70 max	245 max	E
AVERAGE CATHODE CURRENT	20 max	70 max	E 1
PLATE DISSIPATION	1 max	zom .	Wal
GRID-No.2 INPUT.	1	1.8 max	1 N
PEAK HEATER-CATHODE VOLTAGE:		000	\$
Heater negative with respect to cathode	200 3803	200 200	
Heater positive with respect to cathode	Z00-max	TOM007	2

its its its its its its its its

Maximum Circuit Values:

2.2 max megohms 1 max megohm 1 max 2.2 max For fixed-bias operation..... For cathode-bias operation.... Grid-No.1-Circuit Resistance:

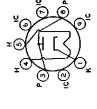
The duration of the voltage pulse must not exceed 15 per cent of one vertical scanning cycle. In a 525-line, 30-frame system, 15 per cent of one vertical scanning cycle is 2.5 milliseconds.

An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

The dc component must not exceed 100 volts. • This value may be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

HALF-WAVE VACUUM RECTIFIER

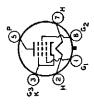
ceiversemploying series-connected heater strings. Outline 8D, OUTLINES SECTION. Tube re-6, 7, and 9 should not be used as tie points. It is especially important that this tube, like other Miniature type used as damper tube in horizontal-deflection circuits of television requires miniature nine-contact socket and may power-handling tubes, be adequately ventilated. be mounted in any position. Socket terminals 2,



heater negative with respect to cathode, 2000 max (the dc component must not exceed 500 volts); type is used principally for renewal purposes. Heater volts (ac./dc), 17.5; amperes, 0.3; warm-up time (average), 11 seconds. Maximum ratings for damper service (for operation in a 528-line, 30-frame system); peak inverse plate volts, 2000 max; peak plate ma., 450 maz; dc plate ma., 75 maz; plate dissipation, 3 maz watts; peak heater-cathode volts;

BEAM POWER TUBE

as class A. amplifier: plate volts, 200; grid-No.2 volts, 125; grid-No.1 volts, -17; plate ma., 40; tion-amplifier tube in television receivers em-ploying series-connected heater strings. Outline OUTLINES SECTION. Tube requires octal socket and may be operated in any position. up time (average), 11 seconds. Characteristics Heater volts (ac/dc), 18.5; amperes, 0.3; warm-Glass octal type used as horizontal-deflec-



grid-No.2 ma., 1.1; transconductance, 4800 µmhos; plate resistance (approx.), 27000 ohms.

HORIZONTAL-DEFLECTION AMPLIFIER

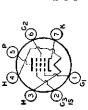
For operation in a 525-line, 30-frame system Maximum Ratings, (Design-Maximum Values):

950	T7711 1000	3000 max	- 600 mar	200	Ten max	-250 max	310 max	90 000	2	Z.5 max	2 max
WOUNDING TO THE PROPERTY OF TH	DC Brans Voltage	U. Linking Drawn Drawn Wormschie	FEAK FOSITIVE-FULSE FLATE FOUNDER	PEAK NEGATIVE-PULSE PLATE VOLTAGE	DC CRID-No.2 (SCREEN-GRID) VOLTAGE	DEAR MEGATIVE PILISE GRID-NO.1 (CONTROL-GRID) VOLTAGE	The Comment of the Co	FEAR CATHODE CORRECT.	AVERAGE CATHODE CURRENT	GRID-NO.2 INPUT.	PLATE DISSIPATION

= Technical Data

PBAK HEATER-CATHODB VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode.	200 max 200 max	volts
BULB TEMPERATURE (At hottest point)	190 max	ပ္
Maximum Circuit Value:		
Grid-No.1-Circuit Resistance: For grid-resistor-bias operation	1 max	1 max megohm
# The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds. Under no circumstances should this absolute value be exceeded.	scanning cy seconds.	cle. In a

An adequate bias resistor or other means is required to protect the tube in the absence of excitation.
 The dc component must not exceed 100 volts.



lts lts

REMOTE-CUTOFF PENTODE

8FW6A Miniature type used as rf- and ifamplifier tube in ac/de radio receivers. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact

18FW6

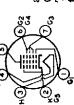
position. Heater volts (ac/dc), 18; amperes, 0.1; warm-up time (average), 18socket and may be mounted in any FW6-A, 20 seconds.

CLASS A, AMPLIFIER

/alues):	
aximum	
Design-M	
Ratings, (
Maximum	;
Ī	•

PLATE VOLTAGE.	150 max	volts
GRID-No.2 (SCREEN-GRID) SUPPLY VOLTAGE	150 max	volts
GRID-No.2 Voltage.	See curve page 70	page 70
GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	0 max	volts
GRID-NO.2 INPUT:		
For grid-No.2 voltages up to 75 volts.	0.6 max	watt
For grid-No.2 voltages between 75 and 150 volts.	See curve page 70	page 70
PLATE DISSIPATION.	2.5 max	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max	volts
Heater positive with respect to cathode	100 max	volts

Characteristics:	
Plate Supply Voltage	100 volts
Grid No.3. Connected t	Connected to cathode at socket
Grid-No.2 Supply Voltage	100 volts
Cathode-Bias Resistor	68 ohms
Plate Resistance (Approx.)	0.25 megohm
Transconductance	4400 µmhos
Plate Current	11 ma
Grid-No.2 Current.	4.4 ma
Grid-No.1 Voltage (Approx.) for transconductance of 25 µmhos	-20 volts



PENTAGRID CONVERTER

Miniature type used for converter applications in ac/de radio receivers. Outline 7B, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in

18FX6A 18FX6

CONVERTER

18FX6-A, 20 seconds.

volts volts volts volts

ma watts Ę

any position. Heater volts (ac/dc), 18; amperes, 0.1; warm-up time (average),

	tx volts	tx volts	x volts	tx watts
	150 max	150 max	110 max	1.2 max
Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE.	GRIDS-NO.2-AND-NO.4 (SCREEN-GRID) SUPPLY VOLTAGE	GRIDS-NO.2-AND-NO.4 VOLTAGE.	GRIDS-NO.2-AND-NO.4 INPUT.

Prate Dissipation	1 max	watt	
PEAK HEATER-CATHODE VOLTAGE:	100 max	volts	
Heater negative with respect to calmone	100 max	volts	
Heater positive with respect to caudone			
Typical Operation (Separate Excitation):*			
	100	voits	, , ,
Figle Voltage	100	volta	
Grids-No.Z-and-No.4 (Screen-Crid) Voltage		e flore	
Grid-No.3 (Control-Grid) Voltage	C . T .	F170.	
Grid-No.1 (Oscillator-Grid) Resistor	20000	opms	
Dista Resistance (Annort)	0.4	megohm	
Light Legislative, (** principle)	480	soquin	
Conversion Litalisconductance.	-21	volts	,
Chicago voicage (Applox.) for conversion and	2.3	ma	
Plate Current.	c	e E	
Grids-No.2-and-No.4 Current	1 11		
Gaid. No. 1 Current.	9	e III	
Dead Carried	တ	ma	

Note: The transconductance between grid No.1 and grids No.2 and No.4 connected to plate (not oscillating) is approximately 7000 µmhos under the following conditions: grids No.1 and No.3 at 0 volts; grids No.2 and No.4 and plate at 100 volts. Under the same conditions, the plate current is 24 ma., and

the amplification factor is 22.

* The characteristics shown with separate excitation correspond very closely with those obtained in a self-excited oscillator circuit operating with zero bias.

TWIN DIODE—HIGH-MU TRIODE

18FY6A 18FY6

Miniature type used for combined line 7B, OUTLINES SECTION. Tube requires miniature seven-contact sockdetector, amplifier, and ave tube in compact ac/de radio receivers. Out-

et and may be mounted in any position. Heater volts (ac/dc), 18; amperes, 0.1; warm-up time (average), 18FY6-A, 20 seconds.

TRIODE UNIT AS CLASS A, AMPLIFIER

Maximum Ratings, (Design-Maximum Values): PLATE VOLTAGE GRID VOLTAGE, Positive-bias value. PLATE DISSIPATION.	150 max 0 max 0.5 max	volts volts watt
PBAK HBATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode	100 max 100 max	volts volts
Characteristics: Plate Voltage Grid Voltage	100	volts volt
Amplification Factor The Resistance (Approx.)	100 77000 1300	ohms µmhos
Plate Current.	9.0	ma

SHARP-CUTOFF PENTODE

DIODE UNITS (Each Unit)

Maximum Ratings, (Design-Maximum Values): PLATE CURRENT....

radio receivers. Outline 7B, OUT-LINES SECTION. Tube requires miniature seven-contact socket and may be operated in any position. Miniature type used in the if, rf, and converter stages of ac/dc AM **18GD6A**

c/.pc)		RAGE)
HEATER VOLTAGE (AC/DC)	HEATER CURRENT	WARM-UP TIME (AVERAGE)

volts

ampere seconds $\frac{0.1}{20}$ 18

= Technical Data =

CLASS A: AMPLIFIER

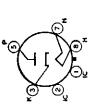
Characteristics:

Plate Supply Voltage,	100	volts
Grid-No.2 (Screen-Grid) Voltage voltage	i to cathode a 100	t socket
Cathode-Bias Resistor.		ohma
Plate Resistance (Approx.)		megohm
Transconductance		umhos
Plate Current	ro.	EE
Grid-No.2 Current. Grid-No.1 Voltage (Approx.), for plate current of 10 µa.	7.2	ma volts
RF AMPLIFIER AND CONVERTER		
Maximum Ratings, (Design-Maximum Values):		
PLATE VOLTAGE.	150 max	volts
GRID-No.2 SUPPLY VOLTAGE.	150 max	volts
GRID-No.2 Voltage.	See curve page 70	page 70
PLATE DISSIPATION.	2.5 max	Watts
For grid-No.2 voltages up to 75 volts	0.6 max	watt
H	See curve page 70	page 70
PEAK HEATER-CATHODE VOLTAGE;		,
Heater negative with respect to cathode	100 max	volts
Heater positive with respect to cathode	100 max	volts

HIGH-MU TWIN POWER TRIODE

all length, 4-3/16 inches; seated height, 3-9/16 inches; diameter, 1-9/16 inches. Tube requires six-contact socket. Filament volts (dc), 2.0; amperes, 0.26. Except for filament current, this Glass type used in output stage of batteryoperated receivers. Maximum dimensions: overtype is electrically identical with type 116-GT. Type 19 is a DISCONTINUED type listed for reference only.

6



HALF-WAVE VACUUM RECTIFIER

Glass octal types used as damper 19AU4GTA diode in horizontal-deflection circuits 19AU4GTA of black-and-white television receivers employing series-connected heater strings. Outline 14F, OUTLINESSEC-

Related type: 6AU4GTA

not be used as tie points. It is especially important that these tubes, like other power-handling tubes, be adequately ventilated. Heater volts (ac/dc), 18.9; am-TION. Tubes require octal socket and may be mounted in any position. These types may be supplied with pin 1 omitted. Socket terminals 1, 2, 4, and 6 should peres, 0.6; warm-up time (average), 11 seconds. Type 19AU4-GTA is used principally for renewal purposes.

DAMPER SERVICE

ш

1 max

For operation in a 525-line, 30-frame system	system		
Marchael Ballana	19AU4-GTA	19A U.	
	Design Maximum Design Center	Design Center	
PEAK INVERSE PLATE VOLTAGE#	4500 max	4500° max	volts
PEAK PLATE CURRENT.	1300 max	1050 max	EUI.
DC PLATE CURRENT	210 max	175 max	ELE.
PLATE DISSIPATION,	6.5 max	5 max	Watts
PEAK HEATER-CATHODE VOLTAGE:			!
Heater negative with respect to cathode	$4500 \pm max$	4500°+max	voits
Heater positive with respect to cathode	300^4max	300*max	volts
If The description of the conference and a constant and a constant of one bank to the contract of	the section of the section of		٠

#The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 36-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

Under no circumstances should this absolute value be exceeded.

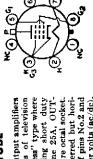
† The dc component must not exceed 900 volts.

A The dc component must not exceed 100 volts.

198666

19BG6GA

Glass octal types used as output amplifiers



type 19BG6-GA is elec-

BEAM POWER TUBE

equipment of the "transformerless" type where high pulse voltages occur during short duty excles. Type 19BG6GA, Outline 25A, OUTLINES SECTION. Tubes require octal socket. in horizontal deflection circuits of television Vertical tube mounting is preferred but horizontal operation is permissible if pins No.2 and No.7 are in vertical plane. Heater volts (ac/dc), Related type: 99099

trically identical with glass octal type 6BG6-G. Type 19BG6-G is a DISCONTINUED type listed for reference only. Type 19BG6-GA is used principally for renewal purposes. 18.9; amperes, 0.3. Except for heater rating and interelectrode capacitances,

SHARP-CUTOFF TETRODE MEDIUM-MU TRIODE—

Related types: SCLBA, 6CLBA

Miniature type used as combined whf oscillator and mixer in television SECTION. Tube requires miniature heaterstrings. Outline 8B, OUTLINES receivers employing series-connected

i H

nine-contact socket and may be operated in any position. Heater volts (ac/dc), 18.9; amperes, 0.15; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with miniature type 6CL8-A.

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-

heaterstrings and using an intermediate employing series-connected Miniature type used as combined oscillator and mixer in television re-

ceivers

Related types:

5EA8, 6EA8

amperes, 0.15; warm-up time (average), 11 seconds. Except for heater ratings, this per second, Outline 8B, OUTLINES SECTION. Tube requires miniature ninecontact socket and may be operated in any position. Heater volts (ac/dc), 18.9; frequency in the order of 40 megacycles type is identical with miniature type 6EA8.

SEMIREMOTE-CUTOFF PENTODE

19HR6 SHR6

Miniature type used as if-amplifier OUTLINES SECTION. Heater volts (ac/dc), 18.9; amperes, 0.15; warm-up tube in FM receivers employing seriesconnected heater strings. Outline 7B,

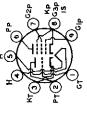
time (average), 17 seconds. Except for heater ratings, this type is identical with miniature type 6HR6

SHARP-CUTOFF PENTODE

19HS6 Related type: \$\$**\$**

Miniature type used as if-amplifier and limiter tube in FM receivers. Out-Heater volts (ac/dc), 18.9; amperes, 0.15; warm-up time (average), 17 secline 7B, OUTLINES SECTION

onds. Except for heater ratings, this type is identical to miniature type 6HS6.



SHARP-CUTOFF PENTODE HIGH-MU TRIODE.

Miniature type used as if-amplifier and af voltage-amplifier tube in radio receivers employing series-connected heater strings. Outline 8B, OUT-

LINESSECTION. Tube requires min-

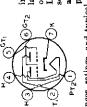
lature nine-contact socket and may be mounted in any position. Heater volts (ac/dc), 18.9; amperes, 0.15.

CLASS A, AMPLIFIER

	Triode	Pentode	
Maximum Ratings, (Design-Maximum Values):	Unit	Unit	
PLATE VOLTAGE.	330 max	330 max	volts
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE.	1	330 max	volts
GRID-No.2 VOLTAGE	1	See curv	See curve page 70
GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	0 max	0 max	volts
PLATE DISSIPATION.	0.55 max	3 max	watts
GRID-NO.2 INPUT:			
For grid-No.2 voltages up to 165 volts.	i	0.55 max	watt
For grid-No.2 voltages between 165 and 330 volts	1	See curv	See curve page 70
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	200 max	200 max	volts
Heater positive with respect to cathode	200 -max	$200 \text{-m} \alpha x$	volts
Characteristics:			
Plate Voltage	100	125	volts
Grid-No.2 Voltage	i	125	volts
Grid-No.1 Voltage.	-1	-	volt
Amplification Factor.	70	1	
Plate Resistance (Approx.).	54000	200000	ohms
Transconductance	1300	6500	soque
Plate Current	8.0	12	#U
Grid-No.2 Current.	ı	4	ma
Grid-No.1 Voltage (Approx.) for plate current of 50 µa	_1 .s	1	volts
Grid-No.1 Voltage (Approx.) for plate current of 20 µa	ı	5 -	volts
Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-bias operation. For cathode-bias operation.	0.5 max 1 max	0.25 max 1 max	megohm megohm

MEDIUM-MU TWIN TRIODE

The dc component must not exceed 100 volts.



Miniature type used for converter service in ac/dc AM and FM receivers and as oscillator, amplifier, or mixer in television receivers of the "transformerless" type.Outline 7B, OUT-LINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position. Heater volts (ac/dc), 18.9; am-

Related types: 516, 616

resistor, 816 ohms; peak oscillator volts, 3; plate resistance, 10200 ohms; conversion transconductance, 1900 µmhos; plate ma., 4.8; plate dissipation, 1.5 max watts; peak heater-cathode volts, 90 max. Type 1916 is used principally for renewal purposes. ratings and characteristics for mixer service (each unit): plate volts, 150 (300 max); cathode-bias tances, ratings, and typical operation as a class A. amplifier, and curves, refer to type 616. Maximum peres, 0.15. For direct interelectrode capaci-

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE ă.

SECTION. Tube requires miniature verter and rf-amplifier tube in radio Miniature type used as FM conreceivers. Outline 8B, OUTLINES

ed in any position. Heater volts (ac/dc), 18.9; amperes, 0.15.

nine-contact socket and may be mount-

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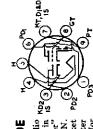
	Triode	Pentode	
Moximum Ratings. (Design-Maximum Values):	Unit	Unit	
	300 max	300 max	volts
FLATE VOLTAGE		000	atlog
GRID-NO.2 (SCREEN-GRID) SUPPLY VOLTAGE	I	ALL OUG	
GRID-No.2 Voltage.	1	See carve page 70	page 10
Chr. No 1 (control_CRD) Vol. AGE. Positive-bias value	0 max	0 max	volts
PLATE DISSIPATION	2.5 max	2.5 max	watts
Carp. No. 9 Input.			
Tourseld No 9 wiltones up to 150 walte	,	0.55 max	watt
For gard-No 9 voltages between 150 and 300 volts	ı	See curve page 70	page 70
Pork Heares-Cathons Voltages			ı •
Heater negative with respect to cathode	200 max	200 max	volts
Heater meiting with regnert to eathorie	200 $^{-}$ max	200 max	volts
Characteristics:			
Dista Valtons	125	125	volts
	ı	125	volts
Grid-No.2 Volcage	,		1
Grid-No.1 Voltage	-1	7	ADIC
Amplification Factor	46	ı	
Dist. Desistance (Approx.)	5400	200000	ohms
Figure Ivenistation (Application)	8500	7500	2mhos
Transconductance	130	-	EUL.
Figure Currents	1	4	E
Chicago Current	•	. 0	1
Grid-No.1 Voltage (Approx.) for plate current of 10 µa	*	ŗ	Votes
Maximum Circuit Values:			
Grid-No.1-Circuit Resistance:			
For fixed-bias operation	2.2 max		megohms
For cathode-bias operation	2.2 maz	2.2 max megohms	megohms

TRIPLE DIODE—HIGH-MU TRIODE

The dc component must not exceed 100 volts.

Related types: 1918

Miniature type used as combined audio amplifier, AM detector, and FM detector in AM/FM receivers of the a_i/c or "transformer" type. Outline 8B, OUTLINES SECTION. Tube requires miniature nine-contact socket



heater ratings, this type is identical with miniature type 6T8-A. Type 19T8 is used principally for renewal purposes.

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE-

Related types: 5XB, 6X8 19X8

Miniature type used as combined line 8B, OUTLINES SECTION. Tube oscillator and mixer tube in "transformerless" AM/FM receivers. Out-

and may be mounted in any position. Heater volts (ac/dc), 18.9; amperes, 0.15. Except for heater ratings, this type is identical with miniature type 6X8. requires miniature nine-contact socket

Glass type used as output amplifier in dry-battery-operated receivers. Filament volts (dc), 3.3; amperes, 0.132. Characteristics as class A, amplifier: plate volts, 135 maz; grid volts, -22.5; plate ma., 6.5; plate resistance, 6300 ohms; amplification factor, 3.3; transconductance, 525 µmhos; load resistance, 6500 ohms; output naw, 110. This is a DISCONTINUED type listed for reference only. POWER TRIODE 20



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DIODE-REMOTE-CUTOFF PENTODE

and AM/FM radio receivers. Outline 8D, OUTLINES SECTION. Tube requires miniature nine-contact socket Miniature type used as combined if amplifier and AM detector in AM

20EQ7 Related types: 6EQ7, 12EQ7

and may be operated in any position. Heater volts (ac/dc), 20; amperes, 0.1. Except for heater ratings, this type is identical with miniature type 6EQ7.

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HIGH-MU TWIN TRIODE

Miniature type used in high-gain, resistance-coupled, low-level audio amplifiers operating at low-signal levels, graphs. Outline 8B, OUTLINES SECsuch as preamplifiers for stereo phono-

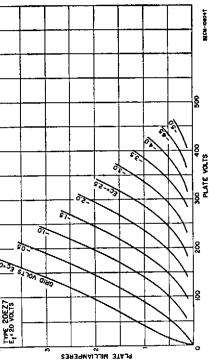
TION Fortypical operation as resistance-coupled amplifier, refer to RESISTAN CE-COUPLED AMPLIFIER SECTION. Tube requires miniature nine-contact socket and may be operated in any position.

volts	ampere	seconds		ď	Jd	ъ́д
20	0.1	20	Unit No.2	1.5	1.6	8.0
			Unit No.1	1.5	1.6	0.2
Heater Volts (ac/dd)	HEATER CURRENT.	HEATER WARM-UP TIME (AVERAGE)	DIRECT INTERRIBETRODES CAPACITANCES:	Grid to Plate,	Grid to Cathode and Heater	Plate to Cathode and Heater

CLASS A, AMPLIFIER (Each Unit)

volts volts volta 0 max 1.2 max 200 max 200¶max 330 max 55 max Peak Heater-Cathode Voltage:
Heater negative with respect to cathode.
Heater positive with respect to cathode. Positive-bias value. Negative-bias value.... PLATE VOLTAGE..... Maximum Ratings, (Design-Maximum Values): PLATE DISSIPATION.... GRID VOLTAGE:

CHARACTERISTICS AVERAGE PLATE



250	2 7	100	62500	1600	1.2
100	7	100	80000	1250	0.5
Plate Voltage	Grid Voltage	Amplification Factor.	Plate Resistance (Approx.)	Transconductance	Plate Current

Without external shield.
 The dc component must not exceed 100 volts.

BEAM POWER TUBE

21EX6 Related type:

Glass octal type used as horizon-tal-deflection amplifier in television receivers employing series-connected heater strings. Outline 25A, OUT-LINES SECTION. Tubes requires oc-

pins 2 and 7 in a vertical plane. Heater volts (ac/dc), 21-5; amperes; warm-up time (average), 11 seconds. Except for heater ratings, this tube is identical with glass tal socket and should be operated vertically (base down or up) or horizontally with octal type 6EX6.

BEAM POWER TUBE

receivers employing series-connected heater strings. Outline 16C, OUT-LINES SECTION. Tube requires duo-Duodecar type used as horizontaldeflection-amplifier tube in television

(Q)

decar twelve-contact socket and may be mounted in any position. Heater volts (ac/dc), 21; amperes, 0.45; warm-up time (average), 11 seconds.

CLASS A, AMPLIFIER

Characteristics:			
Plate Voltage.	9	130	voi
Grid-No.2 (Screen-Grid) Voltage,	130	130	ov
Grid-No.1 (Control-Grid) Voltage	0	-20	vol
Triode Amplification Factor*	ι	7	
Plate Resistance (Approx.)	1	11000	ohn
Transconductance	1	9100	ήuμ _η
Plate Current.	410	20	=
Grid-No.2 Current.	24.	1.75	F
Grid-No.1 Voltage (Approx.) for plate current of 1 ma	1	-33	o

ta ta

ma na lts

• This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded. * Triode connection, grid No.2 connected to plate.

For operation in a 525-line, 30-frame system HORIZONTAL-DEFLECTION AMPLIFIER

	az volts		•			ax volts	ar ma	ar ma	tax watts	ax watts	ax volts
	770 max	6500 max	-1500 max	220 max	-330 max	-55 max	800 mar	230 max	18 max	3.5 max	200 max 200¶max 220 max
Maximum Ratings, (Design-Maximum Values):	DC PLATE SUPPLY VOLTAGE.	PRAK POSITIVE-PULSE PLATE VOLTAGE#	PEAK NEGATIVE-PULSE PLATE VOLTAGE.	GRID-No.2 Voltage.	PEAK NEGATIVE-PULSE GRID-No.1 VOLTAGE	DC GRID-No.1 Voltage.	PEAK CATHODE CURRENT	AVERAGE CATHODE CURRENT	PLATE DISSIPATION	GRID-No.2 Input	PEAK HEATER-CATHODE VOLTAGE: Heater regative with respect to cathode Heater positive with respect to cathode BUIS TEMPERATURE (At hottest point)

Maximum Circuit Values:

Grid-No.1-Circuit Resistance......

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megohm

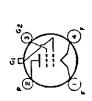
The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a An adequate bias resistor or other means is required to protect the tube in the absence of excitation. 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

The de component must not exceed 100 volts.

umhos ma

volts ohms

SHARP-CUTOFF TETRODE



volts, 135 maz; grid-No.2 (screen-grid) volts, 67.5 maz; grid-No.1 volts, -1.5; plate ma., 3.7; grid-No.2 ma., 1.3; plate resistance, 325000 ohms; Glass type used as rf amplifier in dry-batreceivers. Maximum over-all length, 5-1/32 inches; maximum diameter, 1-13/16 inches. Filament volts (dc), 3.3; amperes, 0.132. Characteristics as class At amplifier: plate transconductance, 500 µmhos. This is a DIS-CONTINUED type listed for reference only.

22

22BH3 Retated types: 6BH3, 17BH3

HALF-WAVE VACUUM RECTIFIER

horizontal deflection circuits of blackand-white television receivers employ-Novar type used as damper tube in ing series-connected heater strings. Outline 17A, OUTLINES SECTION.

ق

Heater volts (ac/dc), 22.4; amperes, 0.450; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with novar type 6BH3.

HALF-WAVE VACUUM RECTIFIER

employing series-connected heater tube in horizontal-deflection circuits of black-and-white television receivers Glass octal type used as damper strings. Outline 14F, OUTLINESSEC-

22DE4 6DE4, 17DE4 TION. Heater volts (ac/dc), 22.4; amperes, 0.45; warm-up time (average), 11 seconds. Except for heater ratings, this type is identical with glass octal type 6DE4.

BEAM POWER TUBE



deflection-amplifier tube in low-B+, Novar type used as horizontalblack-and-white television receivers employing series-connected heater strings. Outline 17A, OUTLINESSEC-

TION. Tube requires novar nine-contact socket and may be mounted in any position.

volts ampere	seconds	នីភ	i d
22 0.45	11	0.7	g
HEATER VOLTAGE (AC/DC). HEATER CUBRENT	HEATER WARM-UP TIME (AVERAGE)	Grid No.1 to Cathoda Hanter Caid No.9 and Grid No.3	Plate to Cathode, Heater, Grid No.2, and Grid No.3

CLASS A, AMPLIFIER

		volts	Connected to cathode at socket	volts	volts
entode	nection	50 130	d to cathod	125 125	-20 0 -20
Q,	Ŝ	20	ecte	125	c
Triode Pentode	Jounection Connection	125	Conn	1	-20
	Characteristics	Plate Voltage.	Grid No.3 (Suppressor Grid)	Grid-No.2 (Screen-Grid) Voltage	Grid-No.1 (Control-Grid) Voltage

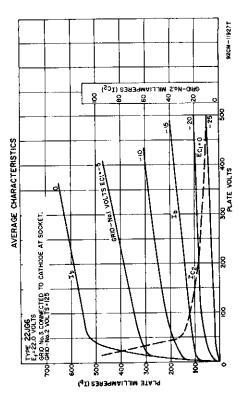
HORIZONTAL-DEFLECTION AMPLIFIER

For operation in a 525-line, 30-frame system

										•	•
	770 max	xpx	2014	75 max	220 max	-55 max	max	950 max	275 max	17 max	3.5 max
	770	6500 max	-1500 max	2	220	155	-330 max	950	275	17	8
Moximum Ratings, (Design-Maximum Values):	DC PLATE SUPPLY VOLTAGE, 770	PRAK POSITIVE-PULSE PLATE VOLTAGE ^G		DC Grid-No.3 Voltage*				PEAK CATHODE CURRENT950	AVERAGE CATHODE CURRENT275	PLATE DISSIPATION 1	GRID-No.2 INPUT
taximum Rafin	C PLATE SUP	EAK POSITIVE	EAK NEGATIVI	C GRID-No.3	C GRID-No.2	C GRID-No.1	BAK NEGATIVI	EAK CATHODE	VERAGE CATH	LATE DISSIPA	PRID-NO.2 INP
_		_	_	_				_	~		_

volts
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= Technical Data =

	volts	volts	ပ္	
	200 max	200∦max	220 max	
Peak Heater-Cathode Voltage:	Heater negative with respect to cathode	Heater positive with respect to eathode	BULB TEMPERATURE (At hottest point)	

Grid-No.1-Circuit Resistance: Maximum Circuit Values:

2.2 max megohms For grid-No.1-resistor-bias operation......

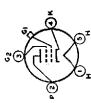
With grid No.2 connected to plate at socket.

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a

 This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded. 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

* In horizontal-deflection-amplifier-service, a positive voltage (typical value, 36 volts) may be applied to grid No.3 to reduce "snivets" interference, which may occur in both whi and uhi television receivers. An adequate bias resistor or other means is required to protect the tube in the absence of excitation.

The dc component must not exceed 100 volts.



ohma

32

SHARP-CUTOFF TETRODE

Typical operation and maximum ratings as class A₁ amplifier: plate volts, 250 (275 max); grid-No.2 volts, 90; grid-No.1 volts, -3; plate re-Glass type used as rf amplifier or biased detector in ac-operated receivers. Maximum over-all length, 5-1/32 inches; maximum diameter, 1-13/16 inches. Tube requires five-contact socket. Heater volts (ac/dc), 2.5; amperes, 1.75.

sistance, 0.6 megohm; transconductance, 1050 mmhos; plate ma., 4; grid-No.2 ma., 1.7 max. This type is used principally for renewal purposes.

POWER PENTODE

25A6-GT used in output stage of ac/dc receivers. Outlines 5 and 14C, respectively, OUT-LINES SECTION. Tubes require octal socket, 160; grid-No.2 volts, 135; plate dissipation, 5.3 watts; grid-No.2 input, 1.9 watts. These are DISCONTINUED types listed for reference Heater volts (ac/de), 25; amperes, 0.3. Maximum ratings as class A1 amplifier: plate volts, Metal type 25A6 and glass octal

25A6GT 25A6

RECTIFIER—POWER PENTODE

No.2 volts, 100 (117 maz); grid-No.1 volts, -15; plate ma., 20.5; grid-No.2 ma., 4; plate resistance, 50000 ohms, transconductance, 1800 25; amperes, 0.3. Typical operation of pentode Glass octal type used as combined halfwave rectifier and power amplifier. Outline 14C, OUTLINES SECTION. Heater volts (ac/dc), unit as class At amplifier: plate volts and grid-

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umhos; load resistance, 4500 ohms; output watts, 0.77. Maximum ratings of rectifier unit; peak inverse plate volts, 350; peak plate ma,, 450; dc output ma,, 75; peak heater-cathode volts, 175. This is a DISCONTINUED type listed for reference only.



HIGH-MU POWER TRIODE

Glass octal type used in output stage of ac/dc receivers. Outline 14C, OUTLINES SEC-TION, Heater volts (ac/dc), 25; amperes, 0.3. Maximum ratings: plate volts, 180 max; plate dissipation, 10 max watts. This is a DISCONTINUED type listed for reference only.

25AC5GT

BEAM POWER TUBE

25AV5GA

6AV5GA, 12AV5GA

Glass octal type used as horizonformer coupling or direct coupling to vision receivers employing either transtal-deflection amplifier tube in tele-

LINES SECTION. Heater volts (ac/dc), 25; amperes, 0.3. Except for heater ratthe deflecting yoke. Outline 19B, OUTings, this type is identical with glass octal type 6AV5-GA.

25AX4GT

12AX4GTA, 12AX4GTB, 17AX4GT, 17AX4GTA 6AX4GT, 6AX4GTB, Related types:

OUTLINES SECTION. This type HALF-WAVE VACUUM RECTIFIER Glass octal type used as a damper tube in horizontal deflection circuits of television receivers. Outline 14C,

ted. Heater volts (ac/dc), 25; amperes, 0.3. Except for heater ratings, this type is may be supplied with pin No.1 omitdentical with glass octal type 6AX4-GT.

DIRECT-COUPLED POWER AMPLIFIER

Glass type used as class At power amplifier. One triode, the driver, is directly connected within the tube to the second, or output, triode. mum ratings and characteristics are the same as Heater volts (ac/dc), 25; amperes, 0.3. Maxifor type 25N6-G. Type 25B5 is a DISCON-TINUED type listed for reference only.

TRIODE—PENTODE

mu triode unit and remote-cutoff pentode unit are independent. Outline 14C, OUTLINESSEC-No.1 volts, -3; plate ma., 7.6; grid-No.2 ma., 2; plate resistance, 185000 ohms; transconduc-TION. Heater volts (ac/dc), 25; amperes, 0.15. amplifier: plate and grid-No.2 volts, 100; grid-Glass octal type used as amplifier. High-Typical operation of pentode unit as class A1

25B8GT

tance, 2000 mmhos. Triode unit; plate volts, 100; grid volts, -1; plate ma., 0.6; amplification factor, 112; plate resistance, 75000; transconductance, 1500 µmhos. This is a DISCONTINUED type listed for

POWER PENTODE

reference only,

ductance, 5000 µmhos; load resistance, 2500 ohns; output watts, 7.1. This is a DISCON-TINUED type listed for reference only. Glass octal type used in output stage of ac/dc receivers. Outline 26, OUTLINES SEC-TION. Heater volts (ac/dc), 25; amperes, 0.3. lypical operation as class At amplifier: plate volts. 200 max; grid-No.2 volts, 135 max; grid-No.1 volts, -23; plate ma., 62; grid-No.2 ma., 1.8; plate resistance, 18000 ohms; transcon-

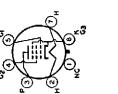
BEAM POWER TUBE

Miniature type used in audio out-Except for heater rating, this type is out stages of television and radio receivers. Also used as video amplifier. Heater voits (ac/dc), 25; amperes, 0.3. Outline 8D, OUTLINES SECTION identical with miniature type 6BK5.

25BK5

Related types: **6BK5, 12BK5**

438





BEAM POWER TUBE

= Technical Data

68Q6GTB/6CU6, 128Q6-Glass octal types used as horizon-tal deflection amplifiers in circuits of 25BQ66T /25CU6 Related types: Tubes require octal socket and may be OUTLINES SECTION. These types television equipment. Outline 15C, may be supplied with pin No.1 omitted.

(ac/dc), 25; amperes, 0.3. Except for heater rating, these types are identical with glass octal types 6BQ6-GT and 6BQ6-GTB/6CU6, respectively. Type 25BQ6-GT GTB/12CU6, 17BQ6GTB mounted in any position. Heater volts is a DISCONTINUED type listed for reference only.

BEAM POWER TUBE

Miniature type used in the audio output stage of radio receivers. Because of its high power sensitivity and high efficiency at low plate and screengrid voltages, it is capable of provid-

Related type:

ing a relatively high power output. Outline 7C, OUTLINES SECTION. Tube Heater volts (ac/dc), 25; amperes, 0.3. Except for heater ratings, this type is requires miniature seven-contact socket and may be mounted in any position. dentical with miniature type 50C5.



BEAM POWER TUBE

Glass octal type used as output amplifier. Outline 26, OUTLINES SECTION. Heater volts (ac/dc), 25; amperes, 0.3. Refer to type 67Yed for typical operation as a class At amplifier, Type 25CG-G is a DISCONTINUED type listed for reference only.

BEAM POWER TUBE

Miniature type used in audio-output stage of radio and television receivers. Outline 7C, OUTLINES SEC-TION. Heater volts (ac/dc), 25; amperes, 0.3. Except for heater ratings, this type is identical with miniature type 12CA5.

Related types: 6CA5, 12CA5

BEAM POWER TUBE

Glass octal types used as horizontal deflection amplifiers in tele-GB, Outline 25A, OUTLINES SECconnected heater strings. Type 25CD6vision receivers employing series-

25CD6GB 25CD6GA Related lype: 6CD6GA

and 6CD6-GA, respectively. Type 25CD6-GA is a DISCONTINUED type listed TION. Heater volts (ac/dc), 25; amperes, 0.6; warm-up time (average), 11 seconds. Except for heater ratings, these types are identical with glass octal types 6CD6-G or reference only.

Refer to type 25BQ6GTB/25CU6

BEAM POWER TUBE

25DN6

Glass octal type used as horizon-



ONICT	tal deflection amplifier in television		6
		きくくさ	7
	heater strings. Outline, 25A, OUT-		
	LINES SECTION. Tube requires)) <u>¥</u>	
octal socket. Vertical	octal socket. Vertical tube mounting is preferred but horizontal operation is per-	operation is p	ė
missible if pins 1 and	missible if pins 1 and 3 are in vertical plane.		
HEATER VOLTAGE (AC/DC)	Heater Voltage (ac/dc)	25 v	volts
HEATER CURRENT	Heater Current	0.6 arm	ampere
HEATER WARY-UP TIME	HEATER WARN-UP TIME (Average)	11 seco	seconda
PLATE RESISTANCE (Appro	PLATE RESISTANCE (Approx.)†	4000 oi	ohma
TRANSCONDUCTANCET	Transconductancet	9000 mm	#mhos
Mu-Factor,† Grid No.2 to	Mu-Facron,† Grid No.2 to Grid No.1	4.35	

E 9 E 8 8

HORIZONTAL DEFLECTION AMPLIFIER

† For plate and grid-No.2 volts, 125; grid-No.1 volts, -18; plate ma., 70; grid-No.2 ma., 6.3,

For operation in a 525-line, 30-frame system Maximum Ratings, (Design-Center Values):

(Canada : 100 cm) (Canada : 100 cm)		
DC PLATE VOLTAGE	700 max	5
Peak Positive-Pulse Plate Voltage# (Absolute Maximum)	6600 $^{\circ}max$	5
Peak Negative-Pulse Plate Voltage.	-1500 max	ž
DC Grid-No.2 (screen-grid) Voltage,	175 max	×
PEAK NEGATIVE-PULSE GRID-NO.1 (CONTROL-GRID) VOLTAGE.	-200 max	5
Peak Cathode Current.	700 max	
AVERAGE CATHODE CURRENT.	200 mar	
GRID-No.2 INPUT.	3 max	W
PLATE DISSIPATIONT	15 max	,
PEAK HEATER-CATHODE VOLTAGE;		
Heater negative with respect to cathode	200 max	ž
Heater positive with respect to cathode.	200 max	5
BULB TEMPERATURE (At hottest point)	225 max	

olts olts olts olts olts una una atts atts atts

olts

Maximum Circuit Value:

The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

Under no circumstances should this absolute value be exceeded. 0.47 max megohm Grid-No.1-Circuit Resistance.....

† An adequate bias resistor or other means is required to protect the tube in the absence of excitation. FThe de component must not exceed 100 volts.

BEAM POWER TUBE

heater strings. Outline 25A, OUT-Glass octal type used as horizontal deflection amplifier in television receivers employing series-connected LINES SECTION, except vertical dimensions are 1/4 inch shorter. Tube requires octal socket and may be operated in any position.



 ⊕ (3)	
ž	

volts ampere seconds	<u> </u>
25 0.6 11	0.6 24 10
Heater Voltage (ac/dc). Heater Vorbage (ac/dc). Wark-Up Time (verrage). Direct Interelectrode Capacitances:	Grid No.1 to Plate. Grid No.1 to Cathode, Heater, Grid No.3, and Grid No.2. Plate to Cathode, Heater, Grid No.3, and Grid No.2.

CLASS A, AMPLIFIER

Characteristics			
Plate Voltage.	9	135	·
Grid-No.2 (Screen-Grid) Voltage.	135	135	
Grid-No.1 (Control-Grid) Voltage	0	-22.5	•
Triode Amplification Factor.	!	80.00	

440

volts volts volts

= Technical Data =

ohms µmhos na ma volts			volts	volts	volts	voits	TD3	Watts	volta volta
4700 7500 70 4.5		700	7000 max	-1500 max	175 max	700 max	200 max	4 max 10 mor	200 max 200*max 225 max
350 1 1038 1 1034 1 1034	IFIER 8ystem			• • • • • • • • • • • • • • • • • • • •					
Plate Resistance (Approx.) Transconductance Plate Current. Grid-No.2 Current. Grid-No.1 Voltage (Approx.) for plate current of 1 ma	HORIZONTAL-DEFLECTION AMPLIFIER For operation in a 525-line, 30-frame system	Махітит Кайлаў, (Design-Maximum Values); DC Plate Supply Voltage	PEAK POSITIVE-PULSE PLATE VOLTAGE.	FEAR INEGALIVE-FULSE FLATE VOLTAGE	PEAK NEGATIVE-PUISE GRID-NO.1 VOLTAGE	PEAK CATHODE CURRENT.	AVERAGE CATHODE CURRENT. CRID-NO.2 INPITE	PLATE DISSIPATION ^Q	Prak Harter-Carbode Voltages: Heater negative with respect to cathode. Heater positive with respect to cathode. Bulb Temperature (At hottest point).

Maximum Circuit Values:

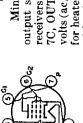
Grid-No.1-Circuit Resistance: For grid-resistor-bias operation....

This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded. 5 max megohms

 This rating is applicable where the duration of the voltage pulse does not exceed 15 per cent of the horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of the horizontal scanning cycle is 10 microseconds.

 $^{\scriptscriptstyle ext{C}}$ An adequate bias resistor or other means is required to protect the tube in the absence of excitation. * The dc component must not exceed 100 volts.

POWER PENTODE



receivers and in phonographs, Outline 7C, OUTLINES SECTION. Heater Miniature type used in the audio output stage of radio and television volts (ac/dc), 25; amperes, 0.3. Except for heater rating, this type is identical with miniature type 6EH5.

6EHS, 12EHS, 50EHS 25EH5 Related types:

BEAM POWER TUBE

Miniature type used in audio-output stage of ac/dc radio receivers em-Tube requires miniature seven-contact socket and may be mounted in any ploying series-connected heater strings. Outline 7C, OUTLINES SECTION position.



voits ampere seconds	jd bi	
25 0.15 17	0,44 12 8	
Heater Voltage (ac/dc). Heater Current. Heater Warn-Up Time (average). Direct Interelectrode Capacitances (Approx.):	Grid No.1 to Plate. Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3. Plate to Cathode, Heater, Grid No.2, and Grid No.3.	

CLASS A, AMPLIFIER

MUNIMUM KOTINGS, (Lesign-Maximum Values);	
PLATE VOLTAGE.	150
D.No 9 (copring ones) Vormers	700 1007
Charles Control Vollage	130 max
F. H. D. H. CONTROL-GRID) VOLTAGE, Positive-bias value.	0 max
FLATE DISSIPATION	5.5 max
GRID-NO.2 INPUT	1

443

RCA Receiving Tube Manual

valts volts	1	COLUM	volts	volts	volts	ohms	soquin'	E E	EU.	ma	TUR	onme	per cent	watts
200 max 200 max 220 max	•	011	110	-1 -2		13000	6400	43	45	90 ·	7.3	2500	t- :	1.5
Prak Hrater-Cathode Voltage: Heater negative with respect to cathode. Heater positive with respect to cathode. Bulb Temperature (At hottest point).	Typical Operation and Characteristics:	Plate Voltage	Grid-No.2 Voltage	Grid-No.1 Voltage	Peak AF Grid-No.1 Voltage.	Plate Resistance (Approx.)	Transconductance	Zero-Signal Plate Current	Maximum-Signal Plate Current.	Zero-Signal Grid-No.2 Current.	Maximum-Signal Grid-No.2 Current	Effective Load Resistance	Total Harmonic Distortion	Maximum-Signal Power Output

Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation	0.1 max 0.5 max	0.1 max megohm 0.5 max megohm
PUSH-PULL CLASS AB, AMPLIFIER		
Maximum Ratings: (Same as for Class AB, amplifier)		
Typical Operation (Values are for two tubes):		
Dista Valtors	110	volts
Light No 2 Voltage	110	voits
Card-No.1 Voltege	æ	volts
Posk AF Grid-No.1-to-Grid-No.1 Voltage	14.4	volts
Zero-Signal Plate Current	85	#U
Maximum-Signal Plate Current.	88	ms
Zero-Signal Grid-No.2 Current.	 	m18
Maximum-Signal Grid-No.2 Current	12.5	ma
Effective Load Resistance (Plate-to-plate)	4500	ohme
Total Harmonic Distortion.	9	per cent

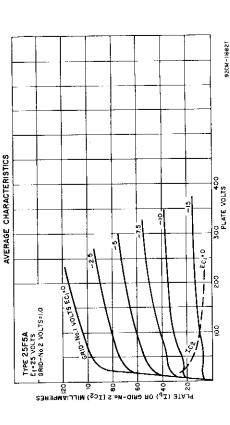
The dc component must not exceed 100 volts.

Total Harmonic Distortion. Maximum-Signal Power Output.

теворш megohm

0.1 max 0.5 max

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- Technical Data

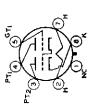
BEAM POWER TUBE

type 25L6-GT used in output stage Metal type 25L6 and glass octal of ac/dc receivers. Outlines 5 and 14C, respectively, OUTLINES SECTION.

2516G 12L6GT, 50L6GT Related types:

ation, and application information, but take into consideration the differences in operation, refer to type 50L6-GT. Refer to miniature type 50C5 for curves, instalmay be mounted in any position. Type 25L6-GT may be supplied with pin No.1 omitted. Heater volts (ac/dc), 25; amperes, 0.3. For maximum ratings and typical heater ratings. Type 25L6 is used principally for renewal purposes. These tubes require octal sockets and S:25L6 NC:25L6-GT

DIRECT-COUPLED TWIN POWER AMPLIFIER



Maximum Circuit Values:

Characteristics as class A₁ amplifier—input triode: plate volts, 100 (180 max); grid volts, 0; peak al grid volts, 29.7; plate ma., 5.8. Output resistance, 4000 ohms; output watts, 3.8. This is a DISCONTINUED type listed for reference triode: plate volts, 180 mar; plate ma., 46; load Glass octal type used as class A₁ power amplifier. Heater volts (ac/dc), 25; amperes, 0.3,

HALF-WAVE VACUUM RECTIFIER

magnetic-deflection circuits of television receivers. Outline 140, OUTLINES SECTION. This type may be supplied with pin No.1 omitted. Tube requires octal socket and may be mounted. this tube, like other power-handling tubes, be adequately ventilated. Heater volts (ac/dc) 25; amperes, 0.3. This type is used principally for Glass octal type used as damper tube in in any position. It is especially important that renewal purposes.

DAMPER SERVICE

Maximum Ratings, (Design-Center Values):

For operation in a 525-line, 30-frame system

FEAR INVERSE FLATE VOLIAGE (Account Martment)	2000 - 1111	\$15A
PEAK PLATE CURRENT	Too max	ma
DC Plate Current	125 max	EE.
PLATE DISSIPATION.	3.5 max	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode (Absolute Maximum)	500 -max	volts
Heater positive with respect to cathode	200 - max	volts

DOKOR LANGE

volts volts # The duration of the voltage pulse must not exceed 15 per cent of one horizontal scanning cycle. In a 525-line, 30-frame system, 15 per cent of one horizontal scanning cycle is 10 microseconds.

Under no circumstances should this absolute maximum value be exceeded.

The dc component must not exceed 100 volts.

VACUUM RECTIFIER-DOUBLER

height, 3-9/16 inches; diameter, 1-9/16 inches. Heater volts (ac/dc), 25; amperes, 0.3. Maxiplate ma. per plate, 450; peak heater-cathode volts, 350; de output ma. per plate, 75. This is a Glass type used as half-wave rectifier or voltage doubler in ac/dc receivers. Maximum dimensions: over-all length, 4-3 /16 inches; seated mum ratings; peak inverse plate volts, 700; peak DISCONTINUED typelisted for reference only.

25Y5

VACUUM RECTIFIER-DOUBLER

Glass type used as half-wave rectifier or voltage doubler in ac/de receivers. Maximum dimensions: over-all length, 4-3/16 inches; seated Tube requires six-contact socket and may be mounted in any position. Heater volts (ac'de), 25; amperes, 0.3. This type is electrically iden-tical with metal type 25Z6. Type 25Z5 is used height, 3-9/16 inches; diameter, 1-9/16 inches. principally for renewal purposes.



VACUUM RECTIFIER-DOUBLER

GT used as half-wave rectifiers or voltage-doublers in ac/do receivers, particularly "transformerless" receivers. Outlines 5 and 14C, respectively, OUTLINES SECTION Type 25Z6wave rectifier or voltage-doubler service: peak 25; amperes, 0.3. Maximum ratings for half-Metal type 25Z6 and glass octal type 25Z6-GT may be supplied with pin No.1 omitted. Tubes require octal socket. Heater volts (ac /dc)

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age doubler: a plate-supply volts per plate (rms), 117; filter-input capacitor, 16 μl; minimum total effective plate-supply impedance per plate (rms), 117; filter-input capacitor, 16 μl; minimum total effective plate-supply impedance per plate, 30 ohms (half-wave), 15 ohms (full-wave); dc output ma., 75. Type 25Z6 is a DISCONTINUED type listed for reference only. Type 25Z6-GT is used principally inverse plate volts, 700 max; peak plate ma. (per plate), 450 max; dc output ma. (per plate), 75 max; peak heater-cathode volts, 350 maz. Typical operation as half-wave rectifier with filter-input capacitor of 16 pt: ac plate-supply volts per plate (rms), 235; minimum total effective plate-supply impedance per plate, 100 ohms; de output ma. per plate, 75; de output volts at input to filter, 255 (at half-load current for renewal purposes,

MEDIUM-MU TRIODE

Filament volts (ac/dc), 1.5; amperes, 1.05. Typical operation as class A: amplifier: plate volts, 180 maz; grid volts, -14.5, plate ma., 6.2; plate re-Glass type used as rf voltage amplifier in ac-operated receivers. Outline 27, OUTLINES SECTION. Tube requires four-contact socket. sistance, 7300 ohms; transconductance, 1150 amhos; amplification factor, 8.3. This is a DIS-CONTINUED type listed for reference only.



LOW-MU TRIODE

intics as class A, amplifier; plate volts, 250 max; grid volts, -21; amplification factor, 9; plate resistance, 9250 ohms; transconductance, 975 amhos; plate ma., 5.2. This type is used principally for renewal purposes. Glass type used as voltage amplifier or detectorin ac-operated receivers. Tube requires fivecontact socket. Heater volts (ac/dc), 2.5; amperes, 1.75. Maximum ratings and character-



POWER TRIODE

tance, 5700 ohms; output watts, 0.375. This is a DISCONTINUED typelisted for reference only. operated receivers. Tube requires four-contact socket. Filament volts (dc), 2.0; amperes, 0.13. Pypical operation as class A₁ amplifier: plate plate resistance, 3600 ohms; amplification factor, Glass type used in output stage of battery-3.8; transconductance, 1050 µmhos; load resisvolts, 180 max; grid volts, -30; plate ma.,

3

SHARP-CUTOFF TETRODE

detector in battery-operated receivers, Maximum over-all length, 5-1/32 inches; maximum 0.06. Typical operation as class A1 amplifier: plate volts, 180 max; grid-No.2 max, 0.4 max; plate resistance, greater than 1 megohm; plate ma., 1.7; transconductance, 650 µmhos. This is a Glass type used as rf amplifier or biased diameter, 1-13/16 inches. Tube requires fourcontact socket. Filament volts (dc), 2.0; amperes, DISCONTINUED typelisted for reference only.

32

POWER PENTODE

Miniature type used in audio out-TION. Tube requires miniature sevencontact socket and may be mounted 32; amperes, 0.1; warm-up time (averput stage of compact ac/dc radio receivers. Outline 7C, OUTLINES SECin any position. Heater volts (ac/dc), age) for type 32ET5A, 20 seconds.

CLASS A, AMPLIFIER

4	150 maz volts 150 maz volts 130 maz volts 1.2 maz watts 5.4 maz watts	200 max volts 200 max volts	110	$\frac{110}{-7.5}$		2.8 ma 2.8 ma 2.50 ohms	5500 µmhos 2800 ohms	10 per cent 1.2 watts
Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE GRID-NO.2 (SCREEN-GRID) VOLTAGE. GRID-NO.2 INPUT PLATE DISSIPATION.	Peak Heater-Cathode Vollage: Heater negative with respect to cathode. Heater positive with respect to cathode	Typical Operation and Characteristics. Plate Voltage.	Grid-No.2 Voltage. Grid-No.1 (Control-Grid) Voltage.	Peak AF Grid-No.1 Voltage. Zero-Signal Plate Current.	Zero-Signal Grid-No.2 Current, Plate Resistance (Approx.)	Transconductance. Load Resistance	Total Harmonie Distortion. Maximum-Signal Power Output.

tor in battery-operated receivers. Tube requires four-contact socket. Filament volts (dc), 2.0; amperes, 0.06. Except for interelectrode capacitances, this type is electrically identical with glass-octal type 1H4-G. Type 30 is a DISCON-TINUED type listed for reference only. Glass type used as voltage amplifier or detec-

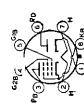
megohm megohm

0.1 max 0.5 max

 The dc component must not exceed 100 volts. For cathode-bias operation.... For fixed-bias operation... Grid-No.1-Circuit Resistance: Maximum Circuit Values:

wave rectifier and output amplifier in ac/dc receivers. Outline 15A, OUTLINES SECTION. Glass octal type used as combined half-Tube requires octal socket, Heater volts (ac/dc), 32.5; amperes, 0.3 Maximum ratings for rectifier unit: ac plate volts (rms), 125; de output

as class A amplifier; plate and grid-No.2 volts, 90; grid-No.1 volts, -7; plate and grid-No.2 wils, 4800 µmhos; load resistance, 2600 ohms; maximum-signal output watts, 1.0. This is a DISCONTINUED type listed for reference only. RECTIFIER—BEAM POWER TUBE



operation as class A, amplifier: plate and gridNo.2 volts, 180 mar; grid-No.1 volts, -18; plate
ma., 22: grid-No.2 ma., 5; plate resistance,
55000 ohms; transconductance, 1750 mmbos;
load resistance, 6000 ohms; utput watts, 1.4. This is a DISCONTINUED type listed for reference only. Glass type used in output stage of battery-operated receivers. Outline 26, OUTLINES SECTION, Tube requires five-contact socket. Filament volts (dc), 2.0; amperes, 0.26. Typical POWER PENTODE

33

The dc component must not exceed 100 volts.

REMOTE-CUTOFF PENTODE

tery-operated radio receivers, particularly those employing ave. Maximum over-all length, 5-1/32 inches: maximum diameter, 1-13/16 Glass type used as rf or if amplifier in batinches. Tube requires four-contact socket. Filament volts (dc), 2.0; amperes, 0.06. Characteristics as class A amplifier: plate volts, 180 mar; grid-No.2 volts, 67.5 max; grid-No.1 volts, -3 5-1/32 inches; maximum diameter,

34

min; plate ma., 2.8; grid-No.2 ma., 1.0; plate resistance, 1.0 megohm; transconductance, 620 µmhos. This is a DISCONTINUED type listed for reference only.

BEAM POWER TUBE	•
Miniature types used in audio out-	(E)
put stages of compact ac/dc radio re-	
ceivers. Outline 7C, OUTLINES SEC-	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
TION. Tubes require miniature seven-	
contact socket and may be operated	⊋,
in any position.	3

34GD5A 34GD5

9.0 0.1	07	9.6	တ္
HEATER VOLTAGE (AC/DC) HEATER CURRENT	Heater Warm-Up Time (average) for 34GD5-A. Direct Interelectrode Capacitances (Apptox.):	Grid No.1 to Plate. Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3	Plate to Cathode, Heater, Grid No.2, and Grid No.3: For 34GD5.A For 34GD5.A.

CLASS A, AMPLIFIER

	150 max	130 max	•	on max	nan 0	1.1 max	5 max	į	200 max	200 max		180 max	250 max
Maximum Ratings, (Design-Maximum Values):	PLATE VOLTAGE	CRID-NO.2 (SCREEN-GRID) VOLTAGE	GRID-NO.1 (CONTROL-GRID) VOLTAGE:	Negative-bias value	Positive-bias value	GRID-No.2 INPUT.	PLATE DISSIPATION.	Peak Heater-Cathode Voltage:	Heater negative with respect to cathode	Heater positive with respect to cathode.	BULB TEMPERATURE (At hottest point):	For 34GD5	For 34GD5-A

volts volts volts

110 -7.5 7.5 35

= Technical Data =

ma ma obms pmhos obms

13000 5700 2500

per cent watts

0.1 max megohm 0.5 max megohm

			+I		91	6	9	-12	4-		-16	16.0 920M-10779T
		-	- FCI		+	<u> </u>			H			140
S		+	CBID - No.1 VOLTS									120
AVERAGE CHARACTERISTICS		1		+			1	1	1		<u> </u>	15
GE CHARA				1		$ar{}$	1	1	1	1	†	BO PLATE VOLTS
AVERA			$ar{}$	1		\downarrow	\downarrow	1,	٠ ن	#1 	+	S
			1		1	#		\				Q
	TYPE 34GD5-A E4 34 VOLTS GRID-No.2 VOLTS-110	-\$		/			1	 			+	50
	1 1	<u> </u>	IC2	1 2	}		1	S 2 A			7	Q

conductance, 1050 µmhos. This is a DISCONTINUED type listed for reference only.

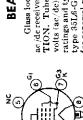
ampere seconds volts

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REMOTE-CUTOFF TETRODE

Glass type used as rf or if amplifier in ac receivers. Maximum over-all length, 5-1/32 inches; maximum diameter, 1-13/16 inches. Tube requires five-contact socket. Heater volts (ac/dc), 2.5; amperes, 1.75. Characteristics as class At amplifier: plate volts, 250 (275 max); grid-No.2 volts, 90 max; grid-No.1 volts, -3 min; plate ma., 6.5; grid-No.2 ma., 2.5; transmin; plate ma., 6.5; grid-No.2 ma., 6.5

35



volts volts watts watts

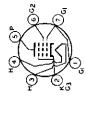
volts volts

BEAM POWER TUBE

ac /dc receivers. Outline 13B, OUTLINES SECTION. Tube requires lock-in socket. Heater volts (ac/dc), 35; amperes, 0.15. For maximum ratings and typical operation, refer to glass octal type 35L6-GT. Type 35A5 is used principally Glass lock-in type used in output stage of for renewal purposes.

BEAM POWER TUBE

Miniature type used in output Because of its high power sensitivity at plate and screen-grid voltages available stage of compact, ac/dcradio receivers. in ac/dc receivers, it is capable of pro-



viding a relatively high power output. Outline 7C, OUTLINES SECTION. Tube Within its maximum ratings, type 35B5 is equivalent in performance to glass-octal type 35L6-GT, and miniature type 35C5. Refer to type 35C5 for typical operation, maximum circuit values, installation, application information, and curves. requires miniature seven-contact socket and may be mounted in any position.

volts ampere	ዃ፟፟፟፟፟	ă	volta	watts	watt	volts volts
35 0.15	9.6	n.	117 max	4.5 max	1.0 max	150 max 150 max
HEATER VOLFAGE (AC/DC) BATISE CHERENT Direct Entre in from entrefore Called Annox 1	Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3	Plate to Cathode, Heater, Grid No.2, and Grid No.3	Maximum Ratings, (Design-Center Values): Pratts Voltage	GRID-NO.2 (SCRREN-CRID) VOLTAGE. PLATE DISSIPATION	GRID-NO.2 INPUT. PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode. Heater positive with respect to cathode.

BEAM POWER TUBE

ceivers, the 35C5 is capable of providing Miniature type used in output stage of compact, ac/deradio receivers. Because of its high power sensitivity and high efficiency at plate and screengrid voltages available in ac/dc re-



for terminal connections and slightly higher ratings, type 35C5 is equivalent in performance to miniature type 35B5 and, within its maximum ratings, to glass octal type 35L6-GT. The basing arrangement of the 35C5 simplifies the problem of meeting Underwriters' Laboratories requirements in the design of ac/dc receivers. a relatively high power output. Except

volts ampere pf pf	volts volts watts watt volts °C	volts volts volts raa ma ma ma ma
35 0.16 0.6 9	150 max 130 max 5.2 max 1.1 max 200 max 200 max 260 max	110 110 7.5 7.5 4 40 41 7
HEATER VOLTAGE (AC/DC) HEATER UNERN. DIRECT INTERRILECTRODE CAPACITANCES (Approx.): Grid No.1 to Plate Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3 Plate to Cathode, Heater, Grid No.2, and Grid No.3	CLASS A ₁ AMPLIFIER Maximum Ratings, (Design-Maximum Values): Charts Voltage. Grap-No.2 (scream-grad) Voltage Plate Dissipation Grap-No.2 Input Grap-No.2 I	Pypical Operation: Plate Voltage Grid-No.2 Voltage Grid-No.1 (Control-Grid) Voltage Grid-No.1 (Control-Grid) Voltage Zero-Signal Plate Current Zero-Signal Flate Current Zero-Signal Grid-No.2 Current Maximum-Signal Grid-No.2 Current

	ohms µmbos ohms per cent	теgоhт теgohm
	13000 5800 2500 10 1.5	0.1 max 0.5 max
Technical Data	Plate Resistance (Approx.) 13000 Transconductance. 5800 Load Resistance. 2500 Total Harmonic Distortion. 10 Maximum-Signal Power Output. 1.5	Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-bias operation. For eathode-bias operation. The dc component must not exceed 100 volts.

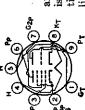
AVERAGE PLATE CHARACTERISTICS
PENTODE CONNECTION

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	538 8E3	IB9MA }	אוררו אוררו		Z=N-0		ې و	k E(I		٦۵			•

INSTALLATION AND APPLICATION

Type 35C5 requires miniature seven-contact socket and may be mounted in any position. Outline 7C, OUTLINES SECTION. It is especially important that this tube, like other power-handling tubes, should be adequately ventilated.

The 35-volt heater is designed to operate under the normal conditions of linevoltage variation without materially affecting the performance or serviceability of the 35C5. For operation of the 35C5 in series with other types having 0.15ampere rating, the current in the heater circuit should be adjusted to 0.15 ampere for the normal supply voltage.



HIGH-MU TRIODE-POWER PENTODE

Miniature type used as two-stage af amplifier where plate supply voltage tifier connected directly to 120-volt ac is obtained from single half-wave rec-

TION, except maximum vertical dimensions are 1/16 inch greater than shown. Tube requires miniature nine-contact socket and may be operated in any position. line. Outline 8E, OUTLINES SEC-Heater volts (ac/dc), 35; amperes, 0.15.

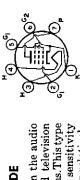
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	voits	volts	TUB	watts	watts
Pentode Unit	150 max	135 max	60 max	6.5 max	1.5 max
Triode Unil	150 max	ı	5 max	0.75 max	ı
Maximum Ratings:	PLATE VOLTAGE.	GRID-NO.Z (SCREEN-GRID) VOLTAGE	CATHODE CURRENT.	PLATE DISSIPATION.	GRID-NO.2 INPUT.

PBAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode.	Triode Unit 200 max 200°max	Pentode Unit 200 max 200°max	volts volts
Typical Operation and Characteristics:			
Plate Supply Voltage	120	145	volts
Grid-No.2 Supply Voltage.	1	120	volts
Cathode-Bias Resistor.	1500	180	ohms
Amplification Factor	100	1	
Plate Current	80	45	ma
Grid-No.2 Current.	ı	9	ma
Transconductance	1400	7500	somun
Load Resistance.	ı	2500	ohms
Power Output.	1	63	watts
Grid Voltage (Approx.), for plate current of 20 µa	-2.5	I	volts
Maximum Circuit Values: Grid-No.1-Circuit Resistance	5 max	0.5 max	0.5 mar megohms

POWER PENTODE

Miniature type used in the audio receivers and in phonographs. This type output stage of radio and television has unusually high power sensitivity and is capable of providing relatively



high power output at low plate and screen-grid voltages with a low af grid-No.1 driving voltage. Outline 7C, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position.

volts	p d	
35 0,15	0.65 17 9	
HEATER VOLTAGE (AC/DC). HEATER CURRENT	Direct Interelectrode Capacitances (Approx.): Grid No.1 to Plate Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3. Plate to Cathode, Heater, Grid No.2, and Grid No.3.	

CLASS A, AMPLIFIER Maximum Ratings, (Design-Maximum Values):

FLATS VOLTAGE	150 max	VOITS
GRID-NO.2 (SCREEN-GRID) VOLTAGE	130 max	volta
GRIP-No.1 (CONTROL-GRID) VOLTAGE, Positive-bias value	0 max	volts
PLATE DISSIPATION.	5 max	Watts
GRID-NO.2 INPUT.	1.75 max	Watts
Peak Heater-Cathode Voltage: Heater negalive with respect to cathode.	200 max	volts
Heater positive with respect to cathode.	200 max	volts
BULE TEMPERATURE (At hottest point)	225 max	ပ္
Typical Operation:		
Plate Supply Voltage	110	volts
Grid-No.2 Supply Voltage	115	volts
Cathode-Bias Resistor	62	ohma
Feak AF Grid-No.1 Voltage	en j	volts
Zero-Signal Flate Current.	82.00	ma
WAXINGUI-Signal Flate (Utreft.	23 °	ma
Maximum-Signal Crid-No.9 Current	2.5	13 13
Plate Rensigning (America)	14000	ma Ch
Transconductance	3000	Simpo
Load Resistance	3000	ohme
Total Harmonia Distortion		

reak Ar Grid-Ind. I voltage.
Zero-Signal Plate Current
Maximum-Signal Plate Current.
Zero-Signal Grid-No.2 Current.
Maximum-Signal Grid-No.2 Current.
Plate Resistance (Approx.).
Transconductance
Load Resistance.
Total Harmonic Distortion
Maximum-Signal Power Output
Maximum Circuit Values:
Grid-No.1-Circuit Resistance:
For fixed-bias operation.
Forwathode-bias operation
#The de component must not exceed 100 volts

The dc component must not exceed 100 volts.

= Technical Data ==

heater circuit of the "universal" type employing rectifier tube 35W4, one or two 35C5s and several 0.15-ampere types, it is recommended that the heater(s) of the 35C5(s) be placed in the circuit so that the higher values of heater-cathode bias is connected to the cathode of the rectifier, i.e., the positive terminal of the rectified voltage supply. Between this side of the line and the 35C5(s), any necessary on the positive side of the line. Under these conditions, heater-cathode voltage of the 35C5 must not exceed the value given under maximum ratings. In a series-This is accomplished by arranging the 35C5(s) on the side of the supply line which In a series-heater circuit of the "dc power line" type employing several 0.15ampere types and one or two 35C5s, the heater(s) of the 35C5(s) should be placed will be impressed on the 35C5(s) rather than on the other 0.15-ampere types, auxiliary resistance and the heater of the 35W4 are connected in series.

or in push-pull combination in the power-output stage of ac/dc receivers. The operating values shown under typical operation have been determined on the basis As a power amplifier (class A₁), the 35C5 is recommended for use either singly that grid-No.1 current does not flow during any part of the input cycle.

92CM-10551T - Eci-CRID-NEI VOLTS ECI=0 AVERAGE CHARACTERISTICS 4 å TYPE 35EHS E4#35 VOLTS GRID-N#2 VOLTS=115 EBRID-NEZ (TCZ) MILLIAMPERES 8



BEAM POWER TUBE

Miniature type used in af poweroutput stage of radio receivers. Outline 7C, OUTLINES SECTION. Tube has heater tap which may be used for operating a 6.3-volt, 150-ma. panel

ig ig lamp in equipment using semiconductor rectifiers. For de output currents greater than 70 ma., a resistor shunting the panel lamp is required. Tube requires mini-ature seven-contact socket and may be operated in any position. WAY MY HEATER BE PA

	volts	VOICE	ampere	andur
or 47 Panel Lamp	8 "	9	1 11	01.0
Panel Lamp	30.0	-	0,15	ı
ER Voltage (ac/dc);	NTIRE HEATER (PINS 3 AND 4)	GREENT:	ETWEEN PINS 3 AND 4 , , , , , , , , , , , , , , , , , ,	THE OWNER OF THE PROPERTY OF T

megohm megohm

0.1 max 0.5 max

per cent watts

CLASS A, AMPLIFIER

volts volts volts watts	volts volts °C	volts volts volts volts rad ma ma ma ma ma ma ma chms chms ohns per cent
14 max 150 max 130 max 5.5 max 1.1 max	200 max 200 max 226 max	110 1110 7.7-7-5 4.55 4.55 12000 75000 75000 75000 250
Maximum Ratings, (Design-Maximum Values): RMS Heater-Tap Voltage, when panel lamp fails Plate Voltage Rib-No.2 (serren-grid) Voltage Plate Dissipation Grid-No.2 Input	FEAK HEATER-CATHOUSE VOLTAGE. Heater negative with respect to cathode. Heater positive with respect to cathode. BULH TEMPERATURE (At hottest point).	Iypical Operation and Characteristics: Grid-No.2 Voltage Grid-No.2 Voltage Grid-No.1 (Control-Grid Voltage Grid-No.1 (Control-Grid Voltage Zero-Signal Plate Current Zero-Signal Plate Current Maximum-Signal Grid-No.2 Current Maximum-Signal Grid-No.2 Current Transconductance Total Resistance

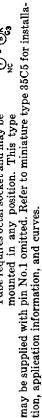
BEAM POWER TUBE

Grid-No.1-Circuit Resistance: For fixed-bias operation.... For cathode-bias operation. Maximum Circuit Values:

megohm megohm

0.1 max 0.5 max

stage of ac/de radio receivers. Outline 14C, OUTLINES SECTION. Tube requires octal socket and may be Glass octal type used in output



voits ampere	PPP
35 0.15	0.6 9.5
Heater Voltage (ac/dc) Heater Ugreria Direct Interedictrode Capacitances (Addoca.):	Grid No.1 to Plate. Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3. Plate to Cathode, Heater, Grid No.2, and Grid No.3.

Cold Mail to Distance of Cold Cold Cold Cold Cold Cold Cold Cold	CARL NOT A A CARLES TIMES AND AND AND AND AND AND AND AND AND AND	Office 190.1 to Cathode, mester, Grid No.4, and Office 190.5.	CLASS A1 AMPLIFIER	Meximum Refines (Design-Center Values):
1				ž

	volts	volts	watts	watt	-11	volts		volte	volta	volts	onme	volts	E.M.	E.L.	ma	E E	onma	- Third	ohtma	Der cent	watts	
	200 max	125 max			, o	30 max	Cathode Bias	200	125	,	180	œ	43	43	67	ro Cu	34000	6100	2000	10	3.0	
		***************************************					Fixed Bias	110	110	12.5	ı	t 10	40	41	673	t-	14000	5800	2500	10	1.5	
Maximum Kalings, (Design-Center Values):	PLATE VOLTAGE	GRID-NO.Z (SCREEN-GRID) VOLTAGE	PLATE DISSIPATION.	GRID-NO.2 INPUT	FEAK HEATER-CATHODE VOLTAGE: Heater negative with regreat to cathode	Heater positive with respect to cathode.	Typical Operation:	Plate Supply Voltage.	Frid-No.2 Supply Voltage.	Frid-No.1 (Control-Grid) Voltage.	Cathode-Bias Resistor.	Peak AF Grid-No.1 Voltage	Zero-Signal Plate Current	Maximum-Signal Plate Current,	Zero-Signal Grid-No.2 Current.	Maximum-Signal Grid-No.2 Current.	Plate Resistance (Approx.)	Pransconductance	Load Resistance	Total Harmonic Distortion.	Maximum-Signal Power Output	
Maximun	PLATE VC	GRID-No.	PLATE D	GRID-NO	FEAK HE Heate	Heate	Typical C	Plate Sur	Grid-No.	Grid-No.	Cathode	Peak AF	Zero-Sign	Maximun	Zero-Sign	Maximun	Plate Res	Transcond	Load Res	Total Ha	Maximun	

HALF-WAVE VACUUM RECTIFIER

Miniature type used in power supply of ac/dc receivers. Equivalent in performance to glass-octal type

35Z NC HEATER VOLTAGE (AC/DC):	35Z5-GT. The heater is provided with a tap for operation of a panel lamp.	*
ENTIRE HEATER (FINS 3 AND PANEL LAMP SECTION (PINS 4 HAATER CYPERAT.	Entire Heater (fins 3 and 4). 35 Second of the second of	5.5 5.5
3 AND 4	BETWEEN PINS 3 AND 4. BETWEEN PINS 3 AND 6.	$\vec{0.15}$
* Without panel lamp.	** With No.40 or No.47 panel lamp.	
;	HALF-WAVE RECTIFIER	

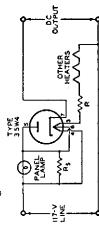
volts volts втреге втреге

	volta	8 8 8 8 8 8 8	voits	volts
	360 max 660 max	66 max 100 max	17 max	360 max 360 max
ALL ATHORN A CHARLES TO THE WAY OF THE WAY OF THE PARTY O	Peak Inverse Plate Voltage Peak Plate Current DC Outeut Current:	With Panel Lamp and Shunting Resistor	PANEL-LAMP-SECTION VOLTAGE (rms): When Panel Lamp Fails.	FEAK HEATER-CATHODE VOLAGE: Heater negative with respect to cathode

INSTALLATION AND APPLICATION

25 50 75 100 LOAD MILLIAMPERES 92CM-6615TI OPERATION CHARACTERISTICS HALF-WAVE RECTIFIER E. S. S. VOLTS BETWEEN PINS NES & NE 4 (NO TAP CONNECTION) TOTAL EFFECTIVE PLATE-SUPPLY IMPEDANCE=15 OHMS C=CAPACITOR INPUT TO FILTER PLATE VOLTS=117 RMS A3TJI3 OT TUGNITA DC OUTPUT VOLTS

heaters (with panel lamp) should equal 117 volts at 0.15 ampere. The shunting resistor R_s is required when dc output current exceeds 60 milliamperes. Values of R_s for dc With the panel lamp connected as shown output currents greater than 60 milliamperes in the diagram, the drop across R and all are given in tabulated data.



	volts μ	ohms ohms ma	voits µf ohms ma
	117 40	16 100 90	r. 117 40 15
	117	150 80	at filte
	117 40	15 15 15 - 300 150 60 70 80	or-inp
	117 117 117 117 40 40 40 40	15 15 15	sapacit
Typical Operation with Panel Lamp:†	AC Plate-Supply Voltage (rms) Filter-Input Cappedior Minerum of Information Processing	Millian Lotal Engeline Lacebuppy Impedance Panel-Lamp Shunding Resistor DC Output Current	† No.40 or No.47 panel lamp used in circuit given below with capacitor-input filter. Typical Operation without Panel Lamp: AC Plate-Supply Voltage (rms) Filter-Input Spacifor Minimum Total Effective Plate-Supply Impedance DC Output Current.

Maximum Circuit Values:

megohm megohm

0.1 max 0.5 max

DC Output Voltage at Input to Filter (Approx.): At half-load current (50 ma.) At full-load current (400 ma.) Voltage Regulation (Approx.): Half-load to full-load current.	135 120 15
Maximum Circuit Values: Panel-Lamp Shunting Resistor:*	
For de output current of \$60 ma \$60 m	800 maz 400 maz 250 maz

* Required when de output current is greater than 60 milliamperes.

HALF-WAVE VACUUM RECTIFIER

Glass lock-in type used in power supply of ac/dc receivers. The heater is provided with tap for the operation of a panel lamp. Outline 13B, OUTLINES SECTION. Tube requires type 35Z5-GT. For typical operation and curves, refer to miniature type 35W4. Type lock-in socket. Heater volts (ac /dc), 35; amperes, 0.15. For maximum ratings, refer to glass octa 35Y4 is used principally for renewal purposes.

HALF-WAVE VACUUM RECTIFIER

Glass lock-in type used in power supply of ac/dc receivers. Outline 13B, OUTLINES SECTION. Tube requires lock-in socket. Heater volts (ac/dc), 35; amperes, 0.15. For maximum ratings and typical operation, refer to glass octal type 35Z5-GT without panel lamp. Type 35Z3 is used principally for renewal purposes.

HALF-WAVE VACUUM RECTIFIER

ac/dereeelvers. Outline 14C, OUTLINES SEC-TION. Tube requires octal socket. This type may be supplied with pin No.1 omitted. Heater Glass octal type used in power supply of ratings and typical operation, refer to glass octal type 35Z5-GT without panel lamp. Type 35Z4-GT is used principally for renewal purposes. volts (ac/dc), 35; amperes, 0.15. For maximum is used principally for renewal purposes.

Glass octal type used in power supply of ac/dc receivers. The heater is provided with a tap for operation HALF-WAVE VACUUM RECTIFIER

35Z5GT

octal socket and may be mounted in any position. This type may be supplied with pin No.1 omitted. For installation and application considerations, refer to minia-LINES SECTION. Tube requires of a panel lamp. Outline 14C, OUT-

ture type 35W4.

HEATWEN PINS 2 AND 7 BETWEEN PINS 3 AND 7 - 0.15
--

ampere

ma 8 E E

60 max 90 max 100 max

Voltage

volts volts

volts

ohms ohms ohms

volts µf ohms ma

volts

µ

ohms

ohms

ohms

volta volta

350 max 350 max

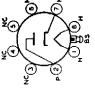
15 max

PANEL-LAMP-SECTION VOLTAGE (rms):
When Panel Lamp Fails.
PEAK HEATER-CATHODE VOLTAGE:
Heater negative with respect to cathode
Heater positive with respect to cathode

voits voits volts AC Plate-Supply Voltage (rms)

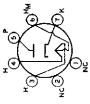
ohma ohma ohma

Typical Operation with Panel Lamp:†





ence only.



36AM3B 36AM3A 36AM3

plate circuit. This heater section is not to be used as a panel-lamp shunt. Outline 7C, OUTLINES SECTION. Tubes require miniature seven-contact socket and may be operated in any position. Type 36AM3 is a DISCONTINUED type listed for reference only. HEA

36 volts 32 volts 0.1 ampere 20 seconds		36AMS	365 max volts	530 max ma	82 max ma	350°max voits 200™max voits
		30A.M3-A 36A.M3-B	365 max	580 max	82 max	350 max 200 max
HEATER VOLTAGE (AC/DC): ENTIRE HEATER (PINS 3 AND 4) TAP SECTION (FINS 3 AND 6) HEATER CURRENT (FINS 3 AND 6) HEATER WARM-UP TIME (Average), For 38AM3-B.	HALF-WAVE RECTIFIER	Maximum Ratings, (Design-Maximum Values):	PEAK INVERSE PLATE VOLTAGE.	Peak Plate Current,	DC OUTPUT CURRENT.	Peak Heater-Carhode Voltage: Heater negative with respect to cathode Heater positive with respect to cathode.

volts 455

Typical Operation with Capacitor Input to Filter:

AC Plate-Supply Voltage (rms)	120	117
Fitter-input Capacitor	40	40
Join Eurechye Flate Supply Registance. DC Output Current.	£_	75
DC Output Voltage	118	105
Characteristics:		
Tube Voltage Drop for plate current of 150 ma	16	20
• The dc component must not exceed 350 volts. The dc component must not exceed 100 volts.		

MEDIUM-MU TRIODE

250 mar; grid volts, -18; plate ma., 7.5; plate resistance, 8400 chms; amplification factor, 9.2; transconductance, 1100 µmhos. This is a DIS Glass type used as voltage amplifier or detector in radio receivers. Tube requires five-contact socket. Heater volts (ac/dc), 6.3; amperes, 0.3. Characteristics as class A1 amplifier: plate voits, CONTINUED type listed for reference only.

37

POWER PENTODE

Tube requires five-contact socket. Heater voits (ac/dc), 6.3; amperes, 0.3. Characteristics as class A1 amplifier: plate and grid-No.2 volts, 250 Glass type used in output stage of radio No.2 ma., 3.8; plate resistance, 0.1 megohm; transconductance, 1200 mmhos; load resistance, 10000 ohms; output watts, 2.5. This is a DISmax; grid-No.1 volts, -25; plate ma., 22; gridreceivers. Outline 24B, OUTLINES SECTION. CONTINUED type listed for reference only.

REMOTE-CUTOFF PENTODE

mar; grid-No.1 volts, -3 min; plate ma., 5.8; grid-No.2 ma., 1.4; plate resistance, 1.0 meg. ohm; transconductance, 1050 µmhos. This is a DISCONTINUED type listed for reference only. receivers, particularly those employing ave. Outline 24B, OUTLINES SECTION. Tube re-Glass type used as rf or if amplifier in radio quires five-contact socket. Heater volts (ac/dc), plifier: plate volts, 250 max; grid-No.2 volts, 90 6.3; amperes, 0.3. Characteristics as class A1 am-

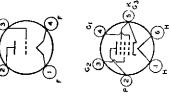
MEDIUM-MU TRIODE

Glass type used as resistance-coupled or TION. Filament volts (dc), 5; amperes, 0.25. Characteristics as class A1 amplifier; plate-supply volts, 180; load resistance, 250000 ohms; impedance-coupled amplifier in battery-opergrid volts, -3; plate ma., 0.2; plate resistance, 150000 ohms; amplification factor, 30; transated receivers. Outline 27, OUTLINES SECconductance, 200 µmbos. This is a DISCON-TINUED type listed for reference only,

POWER PENTODE

ceivers. Tube requires six-contact socket. Heater volts (ac/dc), 6.3; amperes, 0.4. This type is electrically identical with type 6K6-GT. Type 41 Glass type used in output stage of radio reused principally for renewal purposes,

456



= Technical Data =

POWER PENTODE

volta volts

BB See fext above

Glass type used in audio output stage of at receivers. Outline 27, OUTLINES SECTION. Tube requires six-contact socket, Heater volts (ac/dc), 6.3; amperes, 0.7. This type is electrically identical with type 6F6. Type 42 is used principally for renewal purposes.

POWER PENTODE

volts (ac/dc), 25, amperes, 0.3. This type is electrically identical with type 25A6. Type 43 Glass type used in audio output stage of ac/dc receivers. Outline 27, OUTLINES SEC-TION. Tube requires six-contact socket. Heater is used principally for renewal purposes.

POWER TRIODE

Glass type used in output stage of radio receivers. Outline 27, OUTLINES SECTION, Pube requires four-contact socket. Filament volts (ac/dc), 2.5; amperes, 1.5. Typical operation as class A1 amplifier: plate supply volts, 275 max; grid volts, -56; cathode-bias resistor, 1550 ohms; amplification factor, 3.5; plate resistance, 1700 ohms; transconductance, 2050

45

amhos; plate ma., 36; load resistance, 4600 ohms; undistorted power output, 2 watts. This is a DIS-CONTINUED type listed for reference only.

HALF-WAVE VACUUM RECTIFIER

(ac/dc), 45; amperes, 0.075. Maximum ratings: Miniature type used in power supply of small, portable, ac/dc/battery receivers where small size and low heat dissipation are important. Outline TB, OUTLINES SECTION. Tube requires miniature seven-contact socket and may be mounted in any position. Heater volts peak inverse plate volts, 350 mar; peak plate

45Z3

capacitor-input filter: ac paste volts (rms), 117; minimum total effective plate-supply impedance, 15 ohms; de output ma., 65. This is a DISCONTINUED type listed for reference only. ma., 390 maz; de output ma., 65 maz; peak heater-cathode volts, 175 maz. Typical operation with

HALF-WAVE VACUUM RECTIFIER

Glass octal type used in power supply of ac/de receivers. The heater is provided with a tap for operation of a panel lamp. Outline 14C, OUTLINES SECTION, Tube requires octal socket. Without panel lamp, heater volts (ac/dc) 0.15. With panel lamp, heater volts (ac/dc) of panel-lamp section (pins 2 and 3 with 0.15 of entire heater (pins 2 and 7), 45; amperes, ampere between pins 2 and 7), 5.5. Except for

difference in heater voltage, this type has the same ratings and typical operation values as glass octal type 35Z5-GT. Type 45Z5-GT is a DISCON-TINUED type listed for reference only.

DUAL-GRID POWER AMPLIFIER



plification factor, 5.6; transconductance, 2350 µmhos; load resistance for maximum undistorted power output, 6400 ohms; output watts, 1.25. This is a DISCONTINUED type listed for reference only.

POWER PENTODE

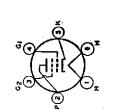
1 and 5 are in vertical plane. Filament volts (ac/dc), 2.5; amperes, 1.75. Typical operation as class At amplifier: plate and grid-No.2 volts, tion. Horizontal operation is permissible if pins Glass type used in audio output stage of radio receivers. Outline 28, OUTLINES SEC-TION. Tube requires five-contact socket and should preferably be mounted in vertical posi-



transconductance, 2500 µmhos; load resistance, 7000 ohms; power output, 2.7 watts. This type is used principally for renewal purposes. $250\ max$; cathode-bias resistor, $450\ ext{ohms}$; plate ma., 31; grid-No.2 ma., 6; plate resistance, $60000\ ext{ohms}$;

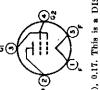
POWER TETRODE:

Glass type used in audio output stage of. powerlines. Outline 28, OUTLINES SECTION.
Heater volts (de), 30; amperes, 0.4. Typical operation as class A1 amplifier; plate volts, 125 maz; grid-No.2 volts, 100 maz; grid-No.2 volts, -20; plate ma., 56; grid-No.2 ma., 9.5; radio receivers designed to operate from de transconductance, 3900 umhos; load resistance, 1500 chms; output watts, 2.5. This is a DIS-CONTINUED type listed for reference only.



DUAL-GRID POWER AMPLIFIER

operated receivers. Outline 27, OUTLINES SECTION, Tube requires five-contact socket. Filament volts (dc), 2.0; amperes, 0.12. Typical grid volts, -20; plate ma., 6; plate resistance, 4175 ohms; amplification factor, 4.7; transcon-Glass type used in output stage of batteryoperation as class At amplifier (grid No.2 connected to plate at socket): plate volts, 135 maz;

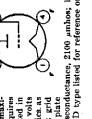


ductance, 1125 mmhos; load resistance, 11000 ohms; output watts (approx.), 0.17. This is a DIS-CONTINUED type listed for reference only.

POWER TRIODE

mum diameter, 2-7/16 inches: Tube requires four-contact socket and should be mounted in vertical position with base down. Filament volts (ac/dc), 7.5; amperes, 1.25. Characteristics as Glass type used in output stage of af am-plifiers employing transformer input coupling. Maximum over-all length, 6-1/4 inches; maxiclass A1 amplifier: plate volts, 450 max; grid volts, -84; cathode resistor, 1530 ohms; plate

50



ma., 55; plate resistance, 1800 ohms; amplification factor, 3.8; transconductance, 2100 µmhos; load resistance, 4350 ohms; output watts, 4.6. This is a DISCONTINUED type listed for reference only.

BEAM POWER TUBE

Glass lock-in type used in output stage of ac dereceivers. Outline 18B. OUTLINES SECTION. Tube requires lock-in socket. Heater volts (ac/dc), 50; amperes, 0.15. For ratings and data, refer to glass-octat type 50L6-GT. Type 50A5 is used principally for renewal purposes.

BEAM POWER TUBE

Miniature type used in output cause of its high power sensitivity at stage of compact ac/dc receivers. Beplate and screen-grid voltages avail-

providing a relatively high power output. Outline 7C, OUTLINES SECTION. able in ac/dc receivers, it is capable of

= Technical Data

Tube requires miniature seven-contact socket and may be mounted in any position. Except for basing arrangement, type 50B5 is identical with miniature type 50C5.

BEAM POWER TUBE

Miniature type used in

output stage of compact, ac/dc radio receivscreen-grid voltages available in ac/dc ers. Because of its high power sensitivity and high efficiency at plate and receivers, the 50C5 is capable of providing a relatively high power output.

Related type

Within its maximum ratings, type 50C5 is equivalent in performance to glass octal type 50L6-GT. The basing arrangement of the 50C5 simplifies the problem of meeting Underwriters' Laboratories requirements in the design of ac/dc receivers.

volts ampere	EEE
50 0,15	0.6 13 8.5
HEATER VOLTAGE (AC/DC). 50 HEATER CURRENT. 0.15 DIRECT INTERLECTRODE (APACITANDES (A DDOL.):	Grid No.1 to Plate Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3 Plate to Cathode, Heater, Grid No.2, and Grid No.3.

CLASS AL AMPLIFIER

Maximum Ratings, (Design-Maximum Values):

volts volts	volts watts	watts	volts volts C
150 max 130 max	0 max 7 max	1.4 max	200 max 200 max 220 max
PLATE VOLTAGE. Grid-No.2 (screen-grid) Voltage	Grid-No.1 (control-Grid) Voltage, Positive-bias value. Plate Dissipation	GRID-No.2 INPUT	FEAK HEATER-CATHODE VOLTAGE. Heater negative with respect to cathode. Heater positive with respect to cathode. BUIS TEMPERATURE (At hottest point).

■ The dc component must not exceed 100 volts.

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volts	volts	volts	volts	B CL	ma	ma	EC1	ohms	emphos m
120	110	œ	90	49	20	₹	8.01	10000	1500
Plate Voltave	Grid-No.2 Voltage	Grid-No.1 (Control-Grid) Voltage	Peak AF Grid-No.1 Voltage	Zero-Signal Plate Current	Maximum-Signal Plate Current.	Zero-Signal Grid-No.2 Current	Maximum-Signal Grid-No.2 Current	Plate Resistance (Approx.)10000	Transconductance, 7500
Plate Voltage	Grid-No.2 Voltage	Grid-No.1 (Control-Grid) V.	Peak AF Grid-No.1 Voltage	Zero-Signal Plate Current,	Maximum-Signal Plate Curr	Zero-Signal Grid-No.2 Curre	Maximum-Signal Grid-No.2	Plate Resistance (Approx.).	Transconductance

240 AVERAGE PLATE CHARACTERISTICS PENTODE CONNECTION GRID-NEI VOLTS ECI =-7 EC. 10 TYPE 50C5
E4=50 VOLTS
GRD-NR2 VOLTS=110 ŝ 2 5

450

92CW-6603T

PLATE VOLTS

BETWEEN PINS 3 AND 6....

HEATER CURRENT:

* Without panel lamp.

PANEL-LAMP SECTION (PINS 4 AND 6).

NTIRE HEATER (PINS 3 AND 4)..

HEATER VOLTAGE (AC/DC):

** With No.40 or No.47 panel lamp.

For fixed-bias operation.

For catbode-bias operation. Grid-No.1-Circuit Resistance: Maximum Circuit Values:

INSTALLATION AND APPLICATION

megohm megohm

Type 50C5 requires miniature seven-contact socket and may be mounted in any position. Outline7C, OUTLINES SECTION. It is especially important that this tube, like other power-handling tubes, be adequately ventilated.

voltage variation without materially affecting the performance or serviceability of the 50C5. For operation of the 50C5 in series with other types having 0.15ampere rating, the current in the heater circuit should be adjusted to 0.15 ampere The 50-volt heater is designed to operate under the normal conditions of linefor the normal supply voltage.

heater circuit of the "universal" type employing rectifier tube 35 W4, one or two 50C5s, and several 0.15-ampere types, it is recommended that the heater(s) of the be impressed on the 50C5(s) rather than on the other 0.15-ampere types. This is In a series-heater circuit of the "de power line" type employing several 0.15-ampere types and one or two 50C5s, the heater(s) of the 50C5(s) should be placed on the positive side of the line. Under these conditions, heater-cathode voltage of the 50C5 must not exceed the value given under maximum ratings. In a series-50C5(s) be placed in the circuit so that the higher values of heater-cathode bias will accomplished by arranging the 50C5(s) on the side of the supply line which is connected to the cathode of the rectifier, i.e., the positive terminal of the rectified voltage supply. Between this side of the line and the 50Cb(s), any necessary auxiliary resistance and the heater of the 35W4 are connected in series.

As a power amplifier (class A_1), the 50C5 is recommended for use either singly or in push-pull combination in the power-output stage of "ac/dc" receivers. The operating values shown under typical operation have been determined on the basis that grid-No.1 current does not flow during any part of the input cycle.

BEAM POWER TUBE

ac/dc receivers. Outline 26, OUTLINES SECTION. Heater volts (ac/dc), 50; amperes, 0.15. Except for heater rating, this type is identical with glass octal type 6Y6-G. Type 50G-G-G is a DISCONTINUED type listed for reference Glass octal type used in output stage of



HALF-WAVE VACUUM RECTIFIER

Miniature type used in power supply of ac/de radio receivers. The heater is provided with a tap for operation of a panel lamp. For typical circuit, refer

to type 35W4. Outline 7C, OUTLINES

SECTION. Tube requires seven-contact socket and may be mounted in any position.

± ⊕,	र्क	ðª

volts volts

* * * 5.5

ampere ampere

0.15

0.15 3.5

Technical Data

HALF-WAVE RECTIFIER

	r volts	x ma	35. D123	x ma	x ma	r wolfe			x volts
	330 max	720 max	70 max	110 max	120 max	16.5 7897	900	330 max	330 max
Maximim Ratings, (Design-Maximum Values):	Peak Inverse Plate Voltage,	PEAK PLATE CURRENT.	DC OUTFOI CORRENT: With Panel I am and No Shunting Resistor	With Land Lamp and (Shunting Resistor*,	Without Panel Lamp	PAREI-LAMP-SECTION VOLTAGE (TMS): When Perel I amp Reils	PEAK HEATER-CATHODE VOLTAGE:	Heater negative with respect to cathode	Heater positive with respect to cathode

117 40 15 200 80 1117 40 15 450 70 AC Plate-Supply Voltage (rms)..... Panel-Lamp Shunting Resistor..... Minimum Total Effective Plate-Supply Impedance.... DC Output Current..... Filter-Input Capacitor

[ypical Operation with Panel Lamp:†

No.40 or No.47 panel lamp used in circuit with capacitor-input filter given under type 35W4.

lų ohms ohms ma

117 40 15 100 90

Typical Operation without Panel Lamp:		
AC Plate-Supply Voltage (rms)	117	volts
Filter-Input Capacitor	40	Ħ
Minimum Total Effective Plate-Supply Impedance	15	ohms
DC Output Current.	110	B ITI
DC Output Voltage at Input to Filter (Approx.):		
At half-load current (55 ma.)	130	volts
At full-load current (110 ma.)	110	volts
Voltage Regulation (Approx.):		
Half-load to full-load current	20	volts
 Required when dc output current is greater than 70 milliamperes. 		

POWER PENTODE



Miniature type used in the audio receivers and in phonographs. Outline 7C, OUTLINES SECTION. Heater output stage of radio and television volts (ac/dc), 50; amperes, 0.15. Except for heater rating, this type is identical with miniature type 6EH5.

6EH5, 12EH5, 25EH5 Related types:

BEAM POWER TUBE

output stages of compact stereophonic Glass octal type used in audioand monophonic phonographs and radio and television receivers. Outline 14F, OUTLINES SECTION. Tube requires octal socket and may be mounted

in any position. Heater volts (ac/dc), 50; amperes, 0.15. Peak heater-cathode volts, heater negative with respect to cathode, 200 max. Except for heater ratings and

ž,

50FE5 Related type:

heater-cathode voltage, this type is identical with glass octal type 6FE5. Miniature type used as audio output amplifier in ac/dc radio receivers. Outline 7C, OUTLINES SECTION. Tube requires seven-contact socket POWER PENTODE

and may be operated in any position.

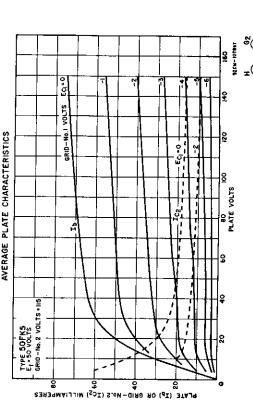
volts ampere pf pf pf	volts volts volts watts watts volts	volts volts obms volts ma ma ma ma obms chmos obms per cett watts
50 0.1 0.65 17	150 max 130 max 0 max 1	110 115 62 3 32 32 85 85 1200 1200 3000 3000
HEATER VOLTAGE (AC/DC) HEATER CURRENT DIRECT INTERELECTRODE CAPACITANCES: Grid No.1 to Plate Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3. Plate to Cathode, Heater, Grid No.2, and Grid No.3.	CLASS A, AMPLIFIER Maximum Ratings, (Design-Maximum Values): PLATE VOLTAGE GRID-NO.2 (GORBEN-GRID) VOLTAGE, POSITIVE-bias value. GRID-NO.1 (CONTROL-GRID) VOLTAGE, POSITIVE-bias value. GRID-NO.2 LINEUT. PAR HEATER-CATHODE VOLTAGE. Heater negative with respect to cathode. Heater Dositive with respect to cathode. Heater Dositive with respect to cathode. BULN TEMPERATURE (At hottest point).	Typical Operation and Characteristics: Plate Supply Voltage. Grid-No.2 Supply Voltage. Cathode-Bias Resistor. Peak AF Grid-No.1 Voltage Zero-Signal Plate Current. Maximum-Signal Brate Current. Maximum-Signal Grid-No.2 Current. Plate Resistance (Approx.). Plate Resistance (Approx.). Load Resistance. Total Harmonic Distortion. Maximum-Signal Power Output.

0.1 Grid-No.1-Circuit Resistance:
For fred-blus operation.
For cathode-blus operation.

The dc component must not exceed 100 volts.

Maximum Circuit Values:

megohm megohm



POWER PENTODE

TION. Tube requires miniature seven-Miniature type used in audio-freceivers. Outline 7C, OUTLINES SECquency power-output stage of radio re-

in any position. The heater is provided with a tap for operation of a panel lamp. Heater volts (ac/dc), 50; amperes, 0.15; tap volts (without panel lamp), 7. contact socket and may be mounted

= Technical Data

CLASS A, AMPLIFIER

Maximum Ralings, (Design-Maximum Values):		
PLATE VOLTAGE.	150 max	voits
GRID-No.2 (SCREEN-GRID) VOLTAGE	130 max	volts
PLATE DISSIPATION,	5.5 max	watts
Grid-No.2 Input.	1.1 max	watts
RMS HEATER-TAP VOLTAGE WHEN PANEL LAMP FAILS	14 max	volts
Heater negative with respect to cathode	200 max	volts
Heater positive with respect to cathode	200 -max	volts
Typical Operation and Characteristics:		
Plate Voltage	110	volts
Grid-No.2 Voltage,	110	volts
Grid-No.1 (Control-Grid) Voltage	-7.5	volts
Peak AF Grid-No.1 Voltage	7.5	volts
Zero-Signal Plate Current	49	ma
Maximum-Signal Plate Current	20	ma
Zero-Signal Grid-No.2 Current.	4	ma
Maximum-Signal Grid-No.2 Current.	10°.	шa
Plate Resistance (Approx.)	10000	ohms
Transconductance	7500	umhos
Load Resistance,	2500	ohms
Total Harmonic Distortion (Approx.)	6	per cent
Maximum-Signal Power Output.	1.9	watts
Maximum Circuit Values:		
Grid-No.1-Circuit Resistance:		
For tathode-bias operation	0.1 mar 0.5 mar	megohm
The de component must not exceed 100 voits.		9

BEAM POWER TUBE

mounted in any position. This type may be supplied with pin No.1 omitstage of ac/dc radio receivers. Outline14C, OUTLINESSECTION. Tube requires octal socket and may be Glass octal type used in output

12L6GT, 25L6, 25L6GT **50**L6GT Related types:

ted. Refer to miniature type 50C5 for installation and application information.

Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3	Heater Voltage (ac/dc) Dirater Cutrent Direct Interelectrode Capacitances (Apptox.): Gid No.1 to Plate	50 0.15 0.6	volts ampere pf
	Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3	15 9.5	Jd bţ

CLASS A1 AMPLIFIER

Wallia IIII To Coura			
Maximum Ratings, (Design-Center Values):			
PLATE VOLTAGE.		200 max	volts
(RID-No.2 (SCREEN-GRID) VOLTAGE		125 max	volts
PLATE DISSIPATION.		10 max	watts
Gath-No.2 Input.	:	1.25 max	watts
Prak Heater-Cathode Vollage:			
Heater negative with respect to cathode		90 max	volts
Heater positive with respect to cathode	:::::::::::::::::::::::::::::::::::::::	90 max	volts
Typical Operation:	ixed Bias	Fixed Bias Cathode Bias	
Plate Supply Voltage	110	200	volts
Grid-No.2 Supply Voltage	210	125	volts
	-7.5	,	volts
Peak AF Grid-No.1 Voltage	7.5	8.0	volts
Cathode-Bias Resistor	1	180	ohma
Zero-Signal Plate Current	49	46	m.
Maximum-Signal Plate Current	50	47	ma
Zero-Signal Grid-No.2 Current.	4	2.2	ma
Maximum-Signal Grid-No.2 Current	10	8.5	ma

VACUUM RECTIFIER-DOUBLER

ocial type 50Y6-GT and, except for heater rating, with glass ocial type 55Z6-GT. Refer to type 52Z6-GT. Refer to operation, and curves. Type 50X6 is used principally for renewal purposes. voltage doubler in ac/de receivers. Outline 13B, OUTLINES SECTION. Tube requires tock-in This type is electrically identical with glass socket. Heater volts (ac/dc), 50; amperes, 0.15. Lock-in type used as half-wave rectifier or

VACUUM RECTIFIER-DOUBLER

KD2

Glass octal type used as half-wave rectifier or voltage doubler in ac/dc receivers. This type is used particularly in "transformerless" receivers of either the ac/dc type or the voltagedoubler type. Outline 14C, OUTLINES

SECTION. This type may be supplied with pin No.1 omitted. Tube requires octal socket. Heater volts (ac/dc), 50; amperes, 0.15. Except for heater rating, this type . Š is electrically identical with type 25Z6-GT.

VACUUM RECTIFIER-DOUBLER

is used particularly in "transformerless" receivers of either the ac/dc type or the voltage doublet type. The heater is provided with a tap for operation of a panel amp, Outline 14 C, OUT. LINES SECTION, Tube requires octal socket. Glass octal type used as half-wave rectifier or voltage doubler in ac/de receivers. This type

Without panel lamp, heater volts (ac/dc) of entire heater (pins 2 and 7), 50; amperes, 0.15. With panel lamp, heater volts (ac/dc) of panel-lamp When operated with a panel lamp and 250-ohm panel-lamp shunting resistor, ratings and typical operation are the same as for type 2526-GT, except that de output current per plate is 65 ma. Type 50Y7-GT is used principally for renewal purposes. section (pins 6 and 7 with 0.15 ampere between pins 2 and 7), 5.5. For maximum ratings and typical operation as half-wave rectifier or voltage doubler without panel lamp, refer to glass octal type 25Z6-GT

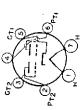
KD2.4 or voltage doubler in ac/dc receivers. Outline 22. OUTLINES SECTION. The heater is provided with a tap for operation of a panel lamp, without panel lamp, heater volts (ac/dc) of entire heater (plins 2 and 7), 50; amperes, 0.15. With panel lamp, heater volts (ac/dc) of panel-Glass octal type used as half-wave rectifier **VACUUM RECTIFIER-DOUBLER**

®,

between pins 2 and 7), 2. Maximum ratings as rectifier or doubler: peak inverse plate volts, 700 maz; peak plate ma. per plate, 400 mar; de output ma. per plate with panel lamp, 65 mar; peak heater-cathode volts, 350 mar; panel lamp section volts (pins 6 and 7), 2.5 mar. This is a DISCONTINUED lamp section (pins 6 and 7 with 0.15 ampere type listed for reference only.

HIGH-MU TWIN POWER TRIODE

type is electrically identical with metal type 6N7. Type 53 is a DISCONTINUED type Glass type used in output stage of acoperated receivers as a class B power amplifier. Outline 27, OUTLINES SECTION. Tube requires medium seven-contact (0.855-inch pin-circle diameter) socket. Heater volts (ac/dc), 2.5; amperes, 2.0. Except for heater rating, this 6N7. Type 53 is a D) listed for reference only.



92CM-105467

PLATE VOLTS

= Technical Data ==

ohms
pmhos
ohms
per cent

28000 8000 4000 10 3.8

POWER PENTODE

Miniature type used in output stages of audio amplifiers, especially tems. This type has extremely high in two-tube series-string stereo sys-

60FX5

12FX5

Related type: power-sensitivity and can be driven to

full output by a ceramic or crystal phonograph pickup. Outline 7C, OUTLINES SECTION. Tube requires seven-contact socket and may be mounted in any position.

60 volts 0.1 ampere	0.65 pf 17 pf 9 pf	
Heater Voltage (ac/dc) Heater Current	DIRECT INTERELECTION CAPACITATION (Approx.): Grid No.1 to Plate Grid No.2, and Grid No.3. Plate to Cathode, Heater, Grid No.2, and Grid No.3.	

CLASS A, AMPLIFIER

	150 max	130 max	5.5 max	2 max	
Махітит Ratings, (Design-Maximum Values):	PLATE VOLTAGE	GRID-No.2 (SCREEN-GRID) VOLTAGE	PLATE DISSIPATION	GRID-NO.2 INPUT.	Peak Heater-Cathode Voltage:

BULE TEMPERATURE (At hottest point)	

volts volts

volts volts watts

BULB TEMPERATURE (At hottest point). Typical Operation: Plate Supply Voltage.

Cathode-Bias Resistor
Peak AF Grid-No.1 Voltage
Zero-Signal Plate Current
Maximum-Signal Plate Current.
Zero-Signal Grid No.2 Current
Maximum-Signal Grid No.2 Current
Plate Resistance
Transconductance
Load Resistance

volts volts ohms volts ma ma ma

:	:	:	Maximum-Signal Plate Current.	:	:	:	Transconductance	:	Total Harmonic Distortion
٠	•	:	:	1	1	:	:	:	:
÷	:	:		:	:				÷
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Plate Resistance	Transconductance	Load Resistance	п	Maximum-Signal Power Output	
Plate Resistance	Transconductance	Load Resistance	Total Harmonic Distorti	Maximum-Signal Power	Maximum Circuit Values:

ma ohms µmhos ohms per cent

megohm megohm 0.1 max 0.5 max

CHARACTERISTICS AVERAGE Grid-No.1-Circuit Resistance: For fixed-bias operation... For cathode-bias operation.

릙 Erabo VOLTS GRID-NEZ VOLTS=115 TYPE 60FX5 S CICES MILLIAMPER

wave rectifier and output amplifier in ac/dc receivers. Outline 14E, OUTLINES SECTION. unit: peak inverse plate volts, 350; peak plate ma., 420; de output ma., 70; peak heater-Glass octal type used as combined haif-70; amperes, 0.15. Maximum ratings of rectifier Tube requires octal socket. Heater volts (ac/dc),

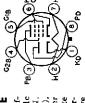


plate-supply impedance, 15 ohms. Typical operation and maximum ratings of beam power unit as class As amplifier: plate and grid-No.2 volts, 110 (117 max); grid-No.1 volts, -7.5; plate ma., 40; grid-No.2 ma., 3; plate resistance, 15000 ohms; transconductance, 7500 µmbos; load resistance, 2000 ohms; output watts, 1.8; plate dissipation, 5 max watts; grid-No.2 input, 1 max watt. This type is used

RECTIFIER—BEAM POWER TUBE

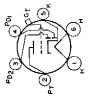
cathode volts, 175; minimum total effective



principally for renewal purposes.

TWIN DIODE—HIGH-MU TRIODE

plifier, and ave tube in radio receivers. Outline 24B, OUTLINES SECTION. Tube requires sixtances and plate volts of 250 mar, this type is contact socket. Heater volts (ac/dc), 6.3; am-Glass type used as combined detector, amperes, 0.3. Except for interelectrode capaci-Type 75 is used principally for renewal purposes. identical electrically with metal type 6SQ7.



REMOTE-CUTOFF PENTODE

Glass type used in rf and if stages of radio receivers, particularly those employing ave. Outline 24B, OUTLINES SECTION, Tube re-6.3; amperes, 0.3. Except for capacitanees, this type is identical electrically with metal type 6K7. Type 78 is used principally for renewal quires six-contact socket. Heater volts (ac/dc),



FULL-WAVE VACUUM RECTIFIER

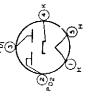
Glass type used in power supply of radio equipment having moderate direct-current requirements. Outline 27, OUTLINES SEC-TION, except maximum over-all length 4 inches; quires four-contact socket and should be mounted preferably in a vertical position. Horizontal mounting is permissible if pins 1 and 4 are in a maximum seated length, 3-3 /8 inches. Tube rehorizontal plane. Filament volts (ac), 5.0; am-



peres, 2.0. For filament operation, refer to type 5U4-G. Type 80 is electrically identical with glass octal type 5Y3-GT. Type 80 is used principally for renewal purposes.

FULL-WAVE VACUUM RECTIFIER

mobile and ac-operated radio receivers. Maximum dimensions: over-all length, 4-3/16 inches; seated height, 3-9/16 inches; diameter, 1-9/16 Glass type used in power supply of auto-Heater volts (ac/dc), 6.3; amperes, 0.5. Maximum ratings: peak inverse plate voits, 1250 max; peak plate ma., 180 max; de output ma., 60 max; peak heater-cathode volts, 450 max. inches. Tube requires five-contact



Lypical operation with capacitor-input filter ac plate-to-plate supply volts (rms), 650; minimum total effective plate-supply impedance per plate, 150 ohms, de output ma., 60. Typical operation with choke-input filter: ac plate-to-plate supply volts (rms), 900; minimum filter-input choke, 10 henries, de output ma., 60. This type is used principally for renewal purpeses.

RECTIFIER—BEAM POWER TUBE

wave rectifier and output amplifier in ac/dc receivers. Outline 14E, OUTLINES SECTION. 117; amperes, 0.09. For ratings and operation of rectifier unit, refer to type 117N7-GT. Typi-Glass octal type used as combined half-Fuberequires octal socket. Heater volts (ac/de),

volts, 5.2; plate ma., 43; grid-No.2 ma., 4 (zero-signal); 5.5 (maximum-signal); plate input, 6 max watts; cal operation of beam power unit as class At amplifier: plate and grid-No.2 volts, 105 (117 max); grid-No.1 volts, -5.2; peak af grid-No.1 ê 8

grid-No.2 dissipation, 1 max watt; plate resistance (approx.), 17000 ohms; transconductance, 5300 mnlos; load resistance, 4000 ohms; total harmonic distortion, 5 per cent; maximum-signal power

RECTIFIER—BEAM POWER TUBE

output, 0.85 watt. Type 117L7/M7-GT is used principally for renewal purposes.

in any position, Heater volts (ac/dc), 117; amperes, 0.09. Maximum ratings of rectifier unit as half-wave rectifier: peak inverse plate volts, Glass octal type used as combined half-wave rectifier and output amplifier in ac/dc re-Tube requires octal socket and may be mounted ma., 75 max; peak heater-cathode volts (heater 350 max; peak plate ma., 450 max; de output ceivers. Outline 14E, OUTLINES SECTION.

negative with respect to cathode), 175 max. Typical operation with capacitor-input filter: ac plate de output volts at input to filter, 122. Typical operation of beam power unit as class A1 amplifier: plate and grid-No.2 volts, 100 (117 max); grid-No.1 volts, -6; peak af grid-No.1 volts, 6; plate ma., 51; grid-No.2 ma., 5; plate dissipation, 5.5 max watts; grid-No.2 input, 1 max watt; plate resistance (approx.), 16000 ohms; transconductance, 7000 μ mhos; load resistance, 3000 ohms; total harmonic distortion, 6 per cent; maximum-signal power output, 1.2 watts. This type is used principally for renewal purposes. supply volts (rms), 177; minimum total effective plate-supply impedance, 15 ohms; dc output ma., 75;

RECTIFIER—BEAM POWER TUBE

wave rectifier and output tube. Outline 14E, OUTLINES SECTION, Tube requires octal socket, Heater volta (ac/dc), 117; amperes, 0.09. This type is electrically identical with glass-octal type 117L7/M7-GT. Type 117P7-GT is Glass octal type used as combined half used principally for renewal purposes.



Miniature type used in power supply of ac/dc battery radio receivers. The heater is designed for operation directly across a 117-volt ac or de supply line. Outline 7C, OUTLINES SECTION. Tube requires miniature seven-contact socket. This tube, like other power-hanventilated. Heater volts (ac/dc), 117; amperes, 0.04. Maxdling tubes, must be adequately

peak inverse plate volts, 330 max; peak plate ma., 540 max; de output ma., 90 max; peak heater-cathode volts; heater negative with respect to cathode, 175 max; heater positive with respect to cathode, 100 imum ratings for half-wave rectifier service: max. This type is used principally for renewal purposes.

HALF-WAVE VACUUM RECTIFIER

Glass octal type used in power supply of ac/dc/battery radio receivers. Maximum overall length, 3 inches; maximum diameter, 1-5/16 inches. Tube requires octal socket. Heater volts (ac/dc), 117; amperes, 0.04. Maximum ratings as half-wave rectifier: peak inverse plate volts, 350 max; peak plate ma., 540 max; peak heatercathode volts, 175 max. Typical operation with

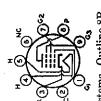
(rms), 117; minimum total effective plate-supply impedance, 30 ohms; de output ma., 90. This is a capacitor-input filter: ac plate supply volts DISCONTINUED type listed for reference only.

voltage doubler in ac/dc receivers, Outline 14C, OUTLINES SECTION. Tube requires octal Glass octal type used as half-wave rectifier or socket and may be mounted in any position. This type may be supplied with pin No.1 omitted. Heater volts (ac/dc), 117; amperes, 0.075. Maximum ratings: peak inverse plate volts, 700 mar; peak plate ma. per plate, 360 mar;

de output ma. per plate, 60 man; peak heater-Typical operation as half-wave rectifier with capacitor-input filter or as halfwave or full-wave voltage doubler: ac plate supply volts per plate (rms), 117; filter-input capacitor, 50 µf; minimum total effective plate-supply impedance per plate, 15 (30 for half-wave doubler service); de output ma, per plate, 60. This type is used principally for renewal purposes. cathode volts, 350 max.

SHARP-CUTOFF PENTODE

type used as audio hum. Especially useful in the input stages of medium-gain public-address duced microphonics, leakage noise, and amplifier in applications requiring re-Miniature



OUTLINES SECTION. Tube requires miniature nine-contact socket and may be systems, home sound recorders, and general-purpose audio systems. Outline 8B, mounted in any position. For operation as resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER SECTION.

IBATER VOLTAGE (AC/DC) IBATER CURRENT IBATER CURRENT Outlote Investignt CAPACITANCES:	6.8 0.15	volts ampere
Grid No.1 to Plate Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3 Plate to Cathode, Heater, Grid No.2, and Grid No.3	0.11 max 2.7 2.4	ada a
Grid No.1 to Plate and Heater. Grid No.1 to Cathode and Heater. Plate to Cathode and Heater. Grid No.2 and grid No.3 connected to plate.	1.4 1.4 0.85	Ä Ä
CLASS A ₁ AMPLIFIER $Triode$ Aximum Ratings, (Design-Maximum $Values$): $Connection*$	Peniode Connection	

Epstavolts GRID-NE2 VOLTS-100	2					ļ			- 1		ĺ		ŀ
5.4.3 GR 10	,												
											-5.0	9	
							-5.0	-2.5	TS EC, 9-3.0				
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			0123		0423	16 EG to 0.5	\$ 0- 0x103	1. C C () 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	16 ECINO -0.5 -1.0 -1.0 -2.0 -2.0 -2.0 -2.0 -2.0 -2.0 -2.0 -2	1b

	Triode Connection*	Pentode Connection	
GRID-No.2 (SCREEN-CRID) VOLTAGE GRID-No.2 SUPPLY OUTAGE AND ACCOUNT OF THE STREET	1-1	See curve page	page
GRID-NO.1 (CONTROL-GRID) VOLTAGE. Negative-bias value. Positive-bias value. PLATE DISSIPATION.	-55 max 0 max 1.7 max	-65 max 0 max 1.25 max	A A
GRID-No.2 INPUT: For grid-No.2 voltages up to 165 volts For grid-No.2 voltages between 165 and 330 volts	1 1	0.25 max w. See curve page	w
PRAK HEATER-CHITODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode	100 max 100 max	100 max 100 max	0 4
Characteristics 100	250 250 187 0.0187 1530 5.5	Connected to cathode at soci 100 vc -3 vc -2 megoh 1000 rm 1.8 vc -8	vc vc vc vc vc vc vc vc vc vc vc vc vc v

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hos olts ma ma

2.2 max megohms

* Grid No.2 and grid No.3 connected to plate.

Grid-No.1-Circuit Resistance.....

olts olts atts 'att

olts

Ep = 6.3 VOLTS GRIDS NR2 & NR3 CONNECTED TO PLATE TYPE 5879 AVERAGE CHARACTERISTICS TRIODE CONNECTION δŹ 2 800 PLATE MILLIAMPERES

volts

330 max

275 max

PLATE VOLTAGE.

BEAM POWER TUBE

92CM-7446T

put stages of radio receivers and audio amplifiers, particularly in the push-pull stages of high-fidelity audio amplifiers. Glass octal type used in the out-Maximum dimensions: over-all length,

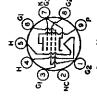
3-15/32 inches; seated height, 2-29/32 inches; diameter, 1-7/16 inches. Tube requires octal socket and may be mounted in any position. For typical operation as and for curves of average plate characteristics, refer to type 6L6-GC. Heater volts push-pull class A1, class AB1 (within maximum ratings), and class AB2 amplifier, (ac/dc), 6.3; amperes, 0.9.

CLASS A1 AMPLIFIER

Pentode Connection volts 400 max volts 23 max watts 3 max watts 200 max volts	250 850 volts 250 250 250 1018 14 18 volts 15 58 ma 80 65 ma 80 65 ma 7.5 6 8.5 ma 7.6 8.5 ma 100 4800 ohms 1100 4800 ohms 1101 13 per cent	0.1 max megohm 0.5 max megohm
Triode Connection* 400 max 400 max 26 max 200 max 200 max	250 300 250 -18 -20 -14 18 20 114 52 78 875 58 8 80 6 8 90 7.6 8 - 30000 5250 - 3100 5250 - 6100 5250 - 6100 5250 - 6100 526 - 6100 527 - 6100	
Maximum Ratings, (Design-Center Values): PLATE VOLTAGE. GRID-NO.2 (SCREBN-GRID) VOLTAGE. PLATE DISSIPATION GRID-NO.2 INPUT. PLATE DISSIPATION HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode Heater positive with respect to cathode	Pypical Operation and Characteristics: Plate Voltage Grid-No.2 Voltage Grid-No.2 Voltage Peak AF Grid-No.1 Voltage Peak AF Grid-No.1 Voltage Exero-Signal Flate Current Maximum-Signal Plate Current Exero-Signal Grid-No.2 Current Amminitation Factor Plate Resistance (Approx.) Transconductance Load Resistance Load Harmonic Distortion Maximum-Signal Power Output.	Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-biss operation: For cathode-biss operation * Grid No.2 connected to plate.

BEAM POWER TUBE

<u>6</u> Miniature type used as power amplifier in compact high-fidelity audio tion over a wide range of power, high power sensitivity, high stability, and equipment. Tube features linear opera-



low heater power, and is capable of delivering high power output at low distortion. Double base-pin connections for both grid No.1 and grid No.2 provide cool operation of grids and thus minimize grid emission and permit use of high values of grid-circuit resistance to reduce driving power. Outline 8E,OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position.

volts ampere pf pf pf	volts volts volts ohms µmhos ma ma volts
6.3 0.45 0.4 max 6	250 250 250 15 7300 4800 46 46 46 46 46
HEATER VOLTAGE (AC/DC) HEATER CURRENT DIRECT FURBERT Grid No.1 to Plate Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3 Plate to Cathode, Heater, Grid No.2, and Grid No.3	Characteristics: CLASS A ₁ AMPLIFIER Plate Voltage Grid-No.2 (Screen-Grid) Voltage Grid-No.1 (Control-Grid) Voltage Flate Resistance (Approx.) Transconductance Transconductance Grid-No.2 Current Grid-No.2 Current Grid-No.2 Vurrent Grid-No.1 Voltage (Approx.) for plate current of 100 µa.

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num Values):	
(Design-Maxin	
Maximum Ratings, (Design-Maximum	PLATE VOLTAGE CERT-NO 9 VOLTAGE

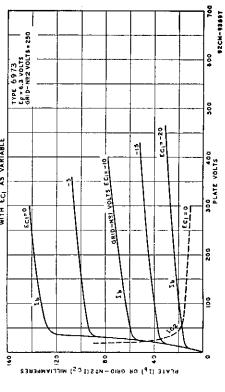
	440 max	330 max	12 max	2 max
manual values, (Design-manue Values);	PLATE VOLTAGE.	United-Notation	FLATE DISSIPATION	GRID-IN O'S INPUT:
man value was the sale and an an an an an an an an an an an an an	PLATE VOLTAGE	GRID-ING, Z YOLTAGE,	CEATE DISSIPATION.	GRID-ING INFOL

volts volts watts watts

= Technical Data =

												_		volts volts		volts	volts	volta	Ina Ina	em em	onms per cent watts		теворы	megohm
	_	0 %										400	92CM-9360T	200 max 200 max 250 max	Bias	310 310	1 6	229	92	<u></u>	2000 17		0.5 max	1 max
	TYPE 6973 EF = 6.3 VOLTS		-		-	-	-		- -			350			Cathode Bias	300	1000	2 4 5 2 8 5 2 8 6	08 86	1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	22 15		:	:
ij	F.J.	5 	- 9	203	052	£c2=200	- 2	11	001 = 2			300			Bias		-25		s 50				-	
CHARACTERISTICS	!			GRID-NE 2 VOLIS ECZ-200	$\frac{1}{1}$	Ę,			ECZ			250	<u>*</u>		Fixed Bias	250 350 250 280	-15			7 3.6 16 14	2 1.5 12.5 20			
ш.				CH2		\perp		-				200	וראוני ה		:(8			: :			:::			rolts.
AVERAGE WITH									-			150		o cathode perthode	r two tabe			Voltage.		ent	vo-brace)			seed 100 v
			<u> </u>				-	-				100	Voltaker	respect trespect to	lues are fo			rid-No.1	nt Current.	urrent Vo.2 Curr	on	ä	ance:	ration st not exc
		_						1				20	Сатнова	tive with tive with trunk (A	tion, (Va	oltage	age	No.1-to-C	ite Curre iai Piate	d-No.2 C	c Distort	oit Value	uit Resistas operat	-bias ope onent mu
	3	4	3	L,	150		00		ŝ	1	_	0	PRAK HRATER-CATHONE VOLTAGE:	Heater negative with respect to cathode Heater positive with respect to cathode Burs Temperature (At hottest point).	Typical Operation, (Values are for two tubes):	Plate Supply Voltage. Grid-No.2 Supply Voltage	No.1 Volt	Peak AF Grid-No.1-to-Grid-No.1 Voltage	Zero-Signal Plate Current. Maximum-Signal Plate Current.	Zero-Signal Grid-No.2 Current	Lifective Load Medicance (Flaue-or-place) Total Harmonic Distortion Maximum-Signal Power Output	Maximum Circuit Values:	Grid-No.1-Circuit Resistance: For fixed-bias operation	For cathode-bias operation The dc component must not exceed 100 volts.
				83	#34W.	MILLIA	31419	t					DEA.	Burr	Typic	Plate	Pro C	Peak	Zero-	Maxi Maxi	Tota Mari	₩ax	Grid	T.

AVERAGE CHARACTERISTICS WITH EC, AS VARIABLE



RCA Receiving Tube Manual

PUSH-PULL CLASS AB, AMPLIFIER

Grid No.2 of Each Tube Connected to Tap on Plate Winding of Output Transforms	am locare and	
m Plat		
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_	Maximum Ratings, (Design-Maximum Values):	Dr. 188 and Ones Mo O Chemical View
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Grid No.2 of Each Tube Connected to Tap on Plate Winding of Output Transformer Maximum Ratings, (Design-Maximum Values);	utput Transformer	
PLATE AND GRID-NO.2 SUPPLY VOLTAGE. PLATE DISSIPATION GRID-NO.2 IMPUT PRAY HEATER-CATHORE VOLTAGE.	410 max 12 max 1.75 max	volts watts watts
Heater negative with respect to cathode. Heater positive with respect to cathode. BULB TEMPERATURE (At hottest point).	200 max 200 max 250 max	voits voits
Typical Operation, (Values are for two tabes): Plate Supply Voltage. State Supply Voltage. Grid-No.2 Supply Voltage. Grid-No.2 Voltage. Grid-No.1 Voltage. Gathode-Blas Resistent Each AF Grid-No.1-to-Grid-No.1 Voltage. Gence-Signal Cathode Current. Gathode Gathode Current. Gatho	Cathode Bias 370 370 62 62 62 62 13000 1.2	volts volts volts volts volts ma ma per cent
	•	97.78

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:

For fixed-bias operation.... For cathode-bias operation.

The dc component must not exceed 100 volts.

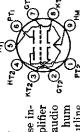
* Obtained from taps on the primary winding of the output transformer. The taps are located on each side of the center tap (B+) so as to apply 50 per cent of the plate signal voltage to grid No.2 of each output tube.

 $\frac{1}{2}$ Obtained from taps on the primary winding of the putput transformer. The taps are located on each side of the center tap (B+) so as to supply 43 per cent of the plate signal voltage to grid No.2 of each output tube.

The type of input-coupling network used should not introduce too much resistance in the grid-No.1 circuit. Transformer- or impedance-coupling devices are recommended.

HIGH-MU TWIN TRIODE

(S) Miniature type used as phase inin high-quality, high-fidelity audio amplifiers where low noise and hum verter or resistance-coupled amplifier



8B, OUTLINES SECTION. This type is identical with miniature type 12AX7 except that it has a controlled equivalent noise and hum characteristic. For operation as resistance-coupled amplifier, RESISTANCE-COUPLED AMPLIFIER are primary considerations. Outline SECTION

Equivalent-Noise and Hum Voltage Referenced to Grid, (Each Unit):

	Average Value (rms)†	
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μvolts μvolts † Measured in "true rms" units under following conditions: heater volts (ac), 6.3 (parallel connection); center tap of heater transformer connected to ground; plate supply volts, 256; plate load resistor, 2700 ohms; cathode-bypass capacitor, 100 µf; grid resistor, 0 ohms; and amplifier covering frequency range between 25 to 10000 cycles per second. . . .

Same conditions as for "Average Value" except: cathode resistor is unbypassed and grid resistor,
 0.05 megohm.

BEAM POWER TUBE

7027A 7027

power amplifier circuits of high-fidelity Glass octal types used in push-pull power sensitivity and high stability and audio equipment. Tubes provide high are capable of delivering high power

No.2 provide for flexibility of circuit arrangement and also cool operation of the output at low distortion. Double base-pin connections for both grid No.1 and grid grids with the result that reverse grid current is minimized. Outline 19D, OUT-

=Technical Data =

octal socket and may be mounted in any position. It is especially important that these tubes, like other power-handling tubes, be adequately ventilated. Type 7027 is Tubes require LINES SECTION, except diameter is 1-5/8 inches max. a DISCONTINUED type listed for reference only.

250 250 250 250 250 250 250 250 250 500 50	HEATER VOLTAGE (AC/DC)	9	volts
1.5 1.0 1.5 2.5 2.5 2.5 2.5 6.000 7.2 7.2		9 00	ampere
1.5 10 10 25 250 250 2250 6000 72 5	SCTRODE CAPACITANCES (Approx.):		
10 7.5 250 250 250 -14 22500 6000 72 5	Plate	1.5	Įα
7.5 250 250 250 2250 6000 72 5	o Cathode, Heater, Grid No.2, and Grid No.3	01	Ĕ.
250 250 250 -14 2250 6000 72	thode, Heater, Grid No.2, and Grid No.3.	7.5	. .
250 250 250 -14 22500 6000 μ 72 5			,
250 250 2250 6000 72 5		950	volta
22500 6000 72 5	n-Grid) Voltage	250	Volts
22500 6000 72 5	trol-Grid) Voltage	-14	volts
6000 72 5	(Approx.)	22500	ohms
7. 2. v	Se	6000	mpos,
ro.		72	ma
	ent	'n	EUL

PUSH-PULL CLASS AB1 AMPLIFIER

Maximum Ratings for 7027-A, (Design-Maximum Values):

megohm megohm

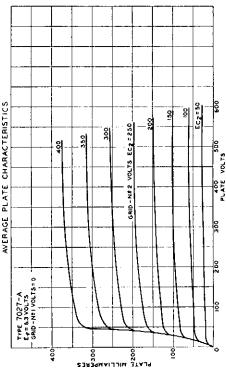
0.5 max 1 max

volts volts	watts	watts	volts volts
600 max 500 max	35 mar	5 max	200 max 200 max
PLATB VOLTAGE. GRID-No.2 VOLTAGE.	PLATE DISSIPATION.	GRID-NO.2 INPUT.	PEAK HEATER-CATHODE VOLTAGE: Heater negative with respect to cathode. Heater positive with respect to cathode.

Typical Operation for 7027-A, (Values are for two tubes);

	volts	volts	olts	ohms	volts	rna	ma	ma	ma	ohms
438	425	425	t	200	98	150	196	œ	20	3800
thode B	100 380 425	380	1	180	68.5	138	170	5.	20	4500
	٧,			200	55	112	128	ţ , -	16	0099
35	540	400	-25 -30 -38	I	76	100				6200
ired Bi	450	350	-30	1	60	95	194	3.4	19.2	0009
134	400	300	-52-	t	20	102	152	9	17	0099
	Plate Supply Voltage	Grid-No.2 Supply Voltage	Grid-No.1 Voltage	Cathode-Bias Resistor.	Voltage	Zero-Signal Plate Current	Maximum-Signal Plate Current	Zero-Signal Grid-No.2 Current	Maximum-Signal Grid-No.2 Current	Effective Load Resistance (Plate-to-Plate).

PLATE



92CM-101327

Maximum-Signal Power Output 34 50 76 32 36	4 4	per cent watts
Maximum Circuit Values: Grid-No.1-Circuit Resistance: For fixed-bias operation. For exthode-bias operation. The de component must not exceed 100 volts.	0.1 max 0.5 max	0.1 <i>maz</i> megohm 0.5 <i>maz</i> megohm

• The type of input coupling network used should not introduce too much resistance in the grid-No.1 circuit. Transformer- or impedance-coupling devices are recommended.

PUSH-PULL CLASS AB, AMPLIFIER

Grid No.2 of Each Tube Connected to Tap on Plate Winding of Output Transformer

olts atts

roits roits

volts
volts
hms
rolts
ma
ma
hms
cent
atts

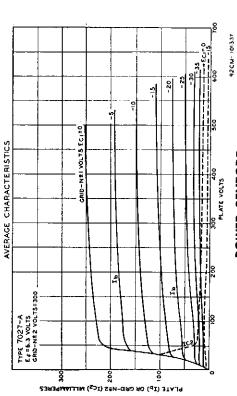
PLATE AND GRID-NO.2 SUPPLY VOLTAGE.	600 max	>
PLATE DISSIPATION.	35 max	¥
PEAK HEATER-CATHODE VOLTAGE:	4.5 max	¥
Heater negative with respect to cathode	200 max	>
Heater positive with respect to cathode	200 -max	**
Typical Operation (Values are for two tubes):		
Plate Supply Voltage	410	>
Grid-No.2 Supply Voltage.	*	>
Cathode-Bias Resistor.	220	ō
Peak AF Grid-No.1-to-Grid-No.1 Voltage	89	Α
Zero-Signal Cathode Current	134	
Maximum-Signal Cathode Current,	155	•
Intelligent Livershame (Trace of place)	9000	2
Maximum-Signal Power Output.		¥
Maximum Circuit Value:		

or cathode-bias operation.. Grid-No.1-Circuit Resistance:

The de component must not exceed 100 volts.

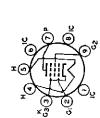
0.5 max megohm

* Obtained from taps on the primary winding of the output transformer. The taps are located on each side of the center tap (B+) so as to apply 43 per cent of the plate signal voltage to grid No.2 of each output tube.



POWER PENTODE

plifter tube in high-fidelity audio equipment. Outline 8E, OUTLINES SEC-TION. Tube requires miniature ninecontact socket and may be mounted Miniature type used as power amin any position. Heater volts (ac/dc), 6.3; amperes, 0.76.



= Technical Data

CLASS A, AMPLIFIER

Characteristics:		
Plate Voltage	250	volts
Grid-No.2 (Screen-Grid) Voltage	250	volts
Grid-No.1 (Control-Grid) Voltage	-7.3	volts
Mu-Factor, Grid No.2 to Grid No.1.	19.5	
Plate Resistance (Approx.)	40000	ohme
Transconductance	11300	#mhos
Plate Current,	48	a m
Grid-No.2 Current.	5.5	7D8

PUSH-PULL CLASS AB, AMPLIFIER

		CT IM-14 0.2	
Maximum Ratings, (Design-Center Values):		Special Connection	
PLATE VOLTAGE	400 max	375 max	volts
GRID-NO.2 VOLTAGE.	300 max	•	volts
CATHODE CURRENT.	65 max	65 max	#un
PLATE DISSIPATION	12 max	12 max	watts
ZERO-SIGNAL GRID-NO.2 INPUT.	2 max	2 max	watts
MAXIMUM-SIGNAL GRID-No.2 INPUT.	4 max	4 max	Watts
Peak Heater-Cathode Voltage:			
Heater negative with respect to cathode	100 max	100 max	volts
Heater positive with respect to cathode	100 max	100 max	volts
		Grid-No.2 Special	
Typical Operation, (Values are for two tubes);		Connection	
Plate Supply Voltage	1	375	volta
Plate Voltage	400	1	volts
Grid-No.2 Supply Voltage.	1	•	
Grid-No.2 Voltage.	300	•	volts
Grid-No.1 Voltage	-15	1	volts
Cathode-Bias Resistor.	ı	220	ohme
Peak AF Grid-No.1 Voltage	14.8	17.7	voits
Zero-Signal Plate Current	15	70	ma
Maximum-Signal Plate Current	105	81	ma
Zero-Signal Grid-No.2 Current,	1.6	•	EM.
Maximum-Signal Grid-No.2 Current.	25	•	m8
Effective Load Resistance (Plate-to-plate)	8000	11000	ohms
Total Harmonic Distortion	4	ಣ	per cent
Maximum-Signal Power Output	24	16.5	Watta

1 max megohm Cathode Bias Fixed Bias 0.8 max Grid-No.1-Circuit Resistance..... Maximum Circuit Values:

Obtained from taps on primary winding of the output transformer. The taps are located on each side of the center tap (B+) so as to supply 43 per cent of the plate signal voltage to grid No.2 of each output tube. · Grid No.2 of each tube connected to tap on plate winding of output transformer.

ó

SHARP-CUTOFF PENTODE MEDIUM-MU TRIODE—

Miniature type used in a wide variety of applications in high-quality, high-fidelity audio equipment, partrol amplifiers, and high-gain voltage ticularly in phase-splitters, tone-con-

ල්,

LINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. For operation as resistance-coupled amplifier, refer to RESISTANCE-COUPLED AMPLIFIER SECTION. In direct-coupled voltageamplifiers in which low hum and reduced noise are required. Outline 8B, OUTamplifier phase-splitter circuits, the pentode unit should drive the triode unit.

ampere 6.3 - 0.45Heater Voltage (ac/dc) Heater Current

volts

DIRECT INTERELECTRODE CAPACITANCES

63	23	6.9	0.06~max	က် ဧပ	
Triode Unit: Grid to Plate	Grid to Cathode and Heater	Flate to Cathode and Heater	Grid No.1 to Plate	Grid No.1 to Cathode, neater, Grid No.2, Grid No.3, and Internal Shield. Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield.	

Equivalent-Noise and Hum Voltage Referenced to Grid:

	Triode Unit	Pentode Unit	
Median Value (rms)	104	35. µvoits	,ta
Maximum Value (rms)	1501	100 nvolts	<u>\$</u>
Measured in "true rms" units under the following conditions: heater volts (ac), 6.3; center tap of	heater volts (ac), 6.3; center tap	jo

heater transformer connected to ground; plate-supply volts, 250; plate load resistor, 0.1 megohm; eathods resistor, 1500 danis; grid resistor, 0.5 megohm; and amplifier covering frequency range between 25 and 10000 cycles per second.

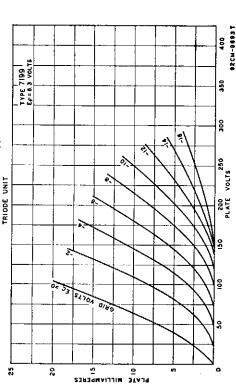
• Same conditions as for triode unit except; grid-No.2 supply volts, 250; grid-No.2 resistor, 0.33 megohm; grid-No.2-bypass capacitor, 0.22 µf; cathode resistor, 1200 ohms; and grid-No.1 resistor, 0.05 megohm.

CLASS A1 AMPLIFIER

Maximum Ralings, (Design-Maximum Values);	Triode Unit	Pentode Unit		
PLATE VOLTAGE.	330 max	330 max	volts	
GRID-NO.2 (SCREEN-GRID) VOLTAGE	l	See curve page 70	page 70	
GRID-NO.2 SUPPLY VOLTAGE.	1	330 max	Volta	
GRID-NO.1 (CONTROL-GRID) VOLTAGE, Positive-bias value.	0 max	nur 0	volts	
PLATE DISSIPATION	2.4 max	3 1002	Watte	
GRID-NO.2 INPUT:		,		
For grid-No.2 voltages up to 165 volts	ı	0.6 max	watt	
For grid-No.2 voltages between 165 and 330 volts.	1	See curve page 70	Dage 70	
PEAK HEATER-CATHODE VOLTAGE:				
Heater positive with respect to cathode	200 max	200 max	volts	
Heater negative with respect to cathode	200 = max	200 -max	voits	

voits volts volts obms meghom µmbos volts 220 130 -62 0.4 7000 PentodeUnit $\frac{-}{1000}$ 100 50 1500 -8.5 -17 0.9081 -40 -40 Plate Supply Voltage. Grid-No.2 Supply Voltage Grid-No.1 Voltage. Cathode-Bias Resistor Transconductance. Grid-No.1 Voltage (Approx.) for plate current of 10 µa. Plate Ourrent. Grid-No.2 Current. Amplification Factor. Plate Resistance (Approx.) **Characteristics**:

AVERAGE CHARACTERISTICS TRIDDE UNIT



Maximum Circuit Values:

Grid-No.1-Circuit Resistance:* For fixed-bias operation For cathode-bias operation

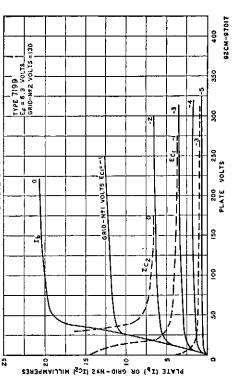
megohm megohm

Triode Unit Pentode Unit 0.5 max 0.25 max 1.0 max 1.0 max

* If either unit is operated at maximum rated conditions, grid-No.1-circuit resistance for both units should not exceed the stated values. The dc component must not exceed 100 volts.

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AVERAGE CHARACTERISTICS PENTODE UNIT



DUAL TRIODE (J.

KT2 €

Miniature type used for combined first- and second-stage audio preampli-

fication in high-fidelity phonograph or tape equipment. Tube has high-mu unit and medium-mu unit. Outline 8B (<u>6</u>) ⊚₹

OUTLINES SECTION. Tube requires miniature nine-contact socket and may be operated in any position. Heater volts (ac/dc), 12.6 (series), 6.3 (parallel); amperes, 0.15 (series), 0.3 (parallel).

PLIFIER
A AM
CLASS

Average Value (rms, cathode bypassed) • Maximum Value (rms, cathode unbypassed) •

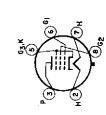
uvolts uvolts

■ Measured in "true rms" units under the following conditions: heater volts (ac), 6.3 (parallel connection); center tap of heater transformer connected to ground; dc plate supply volts, 250; plate load resistor, 0.1 megohn; cathode resistor, 2700 ohms; cathode-bypass capacitor, 100 µt; grid resistor, 0 ohms; amplifier covering frequency range of 25 to 10000 cps. The dc component must not exceed 100 volts.

Same conditions as above, except that cathode resistor is unbypassed and grid resistor is 0.05 megohm.

POWER PENTODE

frequency amplifier systems. Outline Glass octal type used in the power-output stage of high-fidelity audio-14E, OUTLINES SECTION. Tuberequires octal socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.8.



CLASS A, AMPLIFIER

voits voits watts watts

volts volts ma

Maximum Ratings, (Design-Maximum Values):

* 5	200		ngx	nan	nax	nar		20T	rar													ž	1	
500 300	400 200	00#	0 max	18 max	3.5°max	100 max		200 max	200 max		250	225	-15	15	42000	7600	62	74	67	16.5	2500	15	6	-35
PLATE VOLTAGE	GRID-NO.2 (SCREEN-GRID) VOLTAGE	Cert.No.1 (Course of Certs) Worthware Designation Line	Description Country of the Action of the Country of	FLATE DISSIPATION	LUC GRID-NO.Z INPUT	AVERAGE CATHODE CURRENT.	Peak Heater-Cathode Voltage:	Heater negative with respect to cathode.	Heater positive with respect to cathode.	Typical Operation and Characteristics:	Plate Voltage	Grid-No.2 Voltage	Grid-No.1 Voltage	Peak AF Grid-No.1 Voltage	Plate Resistance (Approx.)	Transconductance	Zero-Signal Plate Current.	Maximum Signal Plate Current.	Zero-Signal Grid-No.2 Current	Maximum-Signal Grid-No.2 Current.	Load Resistance	Total Harmonic Distortion (Approx.)	Maximum-Signal Power Output.	Grid-No.1 Voltage (Approx.) for plate current of 500 µa

PUSH-PULL CLASS AB, AMPLIFIER

For fixed-bias operation For cathode-bias operation

Grid-No.1-Circuit Resistance: Maximum Circuit Values:

Maximum Ratings, (Same as for Class A, amplifier):	Ę	
Ratings, (Same as for	2	ier):
Ratings, (Same as for	Ś	amplif
Ratings, (Same as for	5	٧
Ratings, (Same as for	5	Class
_	•	ģ
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_		(Ѕаше
_		Ratings,
		Maximum

The man of the control of the contro			
Typical Operation (Values are for two tubes):			
Plate Voltage	300	400	volts
Grid-No.2 Voltage	250	300	volts
Grid-No.1 Voltage	-21	-34	volts
Peak AF Grid-No.1 Voltage	42	9	volta
Zero-Signal Plate Current.	100	35	am.
Maximum-Signal Plate Current.	185	175	i a
Zero-Signal Grid-No.2 Current,	rc.	107	1 6
Maximum-Signal Grid-No.2 Current.	24	2.6	
Effective Load Registance (Plate-to-plate)	4000	5000	ohme
Total Harmonic Distortion.	0.		Dor cent
Maximum-Signal Power Output	28.5	. 04	watts
 Grid-No.2 input may reach 7 watts during neak levels of snear and music signals. 	h and music a	ionala	

sevels of speech and music signals. The de component must not exceed 100 volts.

= Technical Data =



BEAM POWER TUBE

TION. Tube requires octal socket and Glass octal type used as output amtems. Outline 14C, OUTLINES SECmay be mounted in any position. Heater plifier tube in high-quality sound sysvolts (ac/dc), 6.3; amperes, 0.45.

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Maximum Values):		
PLATE VOLTAGE.	350 max	max
GRID-No.2 (SCREEN-GRID) VOLTAGE,	315 max	max
GRID-NO.2 INPUT.	2.2 max	max
PLATE DISSIPATION	14	14 max
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	200	200 max
Heater positive with respect to cathode	200 max	mar

volts volts watts

volts volts watts

	250 volts	250 volts	-12.5 volts	12.5 volts	45 ma	47 ma	4.5 ma	7 . ma	50000 ohms	4100 µmhos	5000 ohms	7 per cent	4.5 watts
	09	250	0	1	100	ı	22	ſ	1	1	ı	1	t
Typical Operation and Characteristics:	Plate Voltage.	Grid-No.2 Voltage	Grid-No.1 (Control-Grid) Voltage.	Peak AF Grid-No.1 Voltage.	Zero-Signal Plate Current.	Maximum-Signal Plate Current	Zero-Signal Grid-No.2 Current.	Maximum-Signal Grid-No.2 Current.	Plate Resistance (Approx.)	Transconductance	Load Resistance	Total Harmonic Distortion	Maximum-Signal Power Output.

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volts volts volts ohms

Em B TO2 ohms er cent

megohm megohm

0.3 max 1 max

ma

0.1 max megohm 0.5 max megohm	The dc component must not exceed 100 volts. This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.
тах	the n
0.0	that
	such
::	eform
	Way
	urrent
	a rec
	lving
	rolts. i iuvo
	100 v sethoc ed.
	xceed y a n xceed
nce: n. ation.	not ex red b
sistar eratic oper	must measu ili noi
nit Re ias op e-bias	nent n be n ube w
Grid-No.1 Circuit Resistance: For fixed-bias operation. For cathode-bias operation.	The dc component must not exceed 100 volts. This value can be measured by a method invoratings of the tube will not be exceeded.
For fi	ne de nis va ngs of
Grid	TP.

SHARP-CUTOFF PENTODE

Miniature type used in compact audio equipment, especially in lowhum, low-microphonic, high-gain, resistance-coupled-amplifier applications. Outline 7B, OUTLINES SEC-

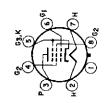
millivolts TION. This type is identical with miniature type $6\mathrm{AU6}$ except that it has a con-1.2 trolled hum characteristic. Hum Output Voltage:

millivolt

+ Measured in "true rms" units under the following conditions: heater volts (ac), 6.3; center tap of heater transformer connected to ground; plate and grid-No.2 supply volts, 250; plate load resistor, 0.27 megohm; grid-No.2 lesistor, 0.8 megohm; grid-No.1 resistor, 0.1 megohm; grid-No.1 resistor, 0.1 megohm; grid-No.1 resistor, 0.1 megohm; grid-No.1 resistor, 0.1 megohm; grid-No.1 resistor, 0.1 megohm; grid resistor, 0.2 megohm; grid resistor of following stage, 10 megohms; and stage gain, 340 Same conditions as above except cathode resistor is unbypassed and stage gain is 110.

POWER PENTODE

quality audio applications. Outline Glass octal type used as audiofrequency power-output tube in high-14C, OUTLINES SECTION. Tuberequires octal socket and may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.8.



CLASS A, AMPLIFIER

watts volts

E watts

Maximum Ratings, (Design-Maximum Values):

PLATE DISSIPATION GRID-NO.2 INPUT. GRID-NO.2 INPUT. FLATE DISSIPATION GRID-NO.2 INPUT. FRAK HEATRR-CATHODE VOLTAGE: Heater negative with respect to cathode Grid-No.2 Voltage Grid-No.2 Voltage Grid-No.1 (Control-Grid) Voltage Peak AF Grid-No.1 Voltage Zero-Signal Plate Current. Maximum-Signal Grid-No.2 Current. Maximum-Signal Grid-No.2 Current. Maximum-Signal Grid-No.2 Current. Maximum-Signal Grid-No.2 Current. Maximum-Signal Grid-No.2 Current. I Triode Amplification Factor* Transconductance Load Resistance (Approx.). Grid-No.1 Current Voltage Transconductance Grid-No.2 Current. Maximum-Signal Power Output. Maximum-Signal Power Output. Maximum-Signal Power Output. Maximum-Signal Power Output. For Kach-Diss operation. For Kach-Diss operation. For Kach-Diss operation.
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volts volts volts

Ħ

ma ma

ohms watts

per cent

megohm

megohms

ohma umhos

PUSH-PULL CLASS AB, AMPLIFIER Maximum Ratings: (Same as for Class A. Amplifier)

Typical Operation, (Values are for two tubes):	Fixed Bias	Cathode Bias	
Plate Supply Voltage	350 450	450	wolfe
Grid-No.2 Supply Voltage	350 400	400	e colta
Grid-No.1 Supply Voltage	-15.5	2	solts.
Cathode-Bias Resistor (Common to both cathodes)		906	*O163
Peak AF Grid-No.1-to-Grid-No.1 Voltage	31	200	Sumo
Zero-Signal Plate Current	100	0 5	Volts
Maximum-Signal Plate Current	180	70	ma
Zero-Signal Grid-No 2 Current		, 4, ,	TO B
Marimum-Signal Crid No 9 Ownerst	4. W . C.	11.5	ma
Described Lond Design - All Land - All Land		22	EUL
Total Hamonia Distantion (Flaue-to-plate).	0099 0099	0006	ohma
Mental Assistantial Listorian	27.	63	per cent
Maximum-Signal Power Output,	30 45	28	Watte

• Grid-No.2 input may reach 6 watts during peak levels of speech and music signals.

The dc component must not exceed 100 volts.

* Triode connection, grid No.2 connected to plate.

amplifier tube. Outline 11C, OUT-LINES SECTION. Tube requires

neonoval nine-contact socket and may

be mounted in any position. Heater volts (ac/dc), 50 volts; amperes, 0.15.

Neonoval type used as at power-

BEAM POWER TUBE



= Technical Data =

CLASS A, AMPLIFIER

Maximum Ratings, (Design-Maximum Values):			
PLATE VOLTAGE.		150 mar	volte
GRID-NO.2 (SCREEN-GRID) VOLTAGE		150 200	1101
Carp-No 2 Invita		200 mag	8104
PLATE DISSIPATION		1.0 mar.	WHILE
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode		200 es 000	1
Heater positive with respect to cathede		200 max	volts
	Fixed	Cathode	
Typical Operation and Characteristics:	Bias	Bias	
Plate Supply Voltage.	130	140	volts
Grid-No.2 Supply Voltage	130	140	volte
Grid-No.1 (Control-Grid) Voltage	7	1	volta
Cathode-Bias Resistor	;	100	opens
Peak AF Grid-No.1 Voltage	=	1 1 2	at loss
Zero-Signal Plate Current	101	100	STOA
Movimum-Signal Plate Current	100	100	R I
Zoro-Signal Crid-No 9 Current	924	201	
Mendanian of the College of the Coll	•	9 ;	ma
Maximum-signal Grid-No.2 Current	01	4	ma
Frate Resistance (Approx.)	2000	i	opus
Transconductance	11000	i	soqua ₁
Load Resistance	1100	1100	ohms
Total Harmonic Distortion	11	11	per cent
Maximum-Signal Power Output	4.5	4.5	Watts
Maximum Circuit Values.			
Grid-No.1-Circuit Resistance:			
For fixed-bias operation	:	0.1 max	megopm
For cathode-bias operation	:	0.5 max	megopm
The de component must not exceed 100 volts.			
PUSH-PULL CLASS AB, AMPLIFIER			
Maximum Ratings, (Same as for Class A, Amplifier);	Fixed	Cathode	
Typical Operation, (Values are for two fubes):	Bias	Bias	
Plate Supply Voltage.	130	140	Volts
Grid-No.2 Supply Voltage,	130	140	volts
Grid-No.1 Voltage	-12	t	volts
Cathode-Bias Resistor	ι	20	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage	22.6	22.6	volts
Zero-Signal Plate Current.	195	210	ma
Maximum-Signal Plate Current.	220	0 2 3	EUL
Zero-Signal Grid-No.2 Current.	6	ø.	t ur
Maximum-Signal Grid-No.2 Current.	24	20	ma
Effective Load Resistance (Plate-to-plate)	1800	1500	ohms
Total Harmonic Distortion	.	▼ ;	per cent
Maximum-Signal Fower Cutput	10	10	watts

Total Harmonic Distortion. Maximum-Signal Power Output.

POWER PENTODE

of high-fidelity audio amplifiers or radio receivers; used in applications put. Outline 10C, OUTLINES SEC-Novar type used in output stages requiring relatively large power out-

tion. It is especially important that this tube, like other power-handling tubes, be TION. Tube requires novar nine-contact socket and may be operated in any posiadequately ventilated

6.3 volts	, ,	11	1 4.4 pf
Heater Voltage (ac/dc) Heater Current	URBOT INTERELECTRODE CAPACITANCES (Approx.):	Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3.	Plate to Cathode, Heater, Grid No.2, and Grid No.3

CLASS A, AMPLIFIER

Maximum Ratings, (Dee gre-Maximum System): Child Lot Sorgen Carlo Voltage Child No.2 (Sorgen-Crip) Voltage Charb Dussleating Charlo Dussleating Charlo Duster Child Charlo Duster Charlo Voltage Heater regative with respect to cathode Hatter positive with respect to cathode Hatter positive with respect to cathode	550 max 140 max 150 max 3.3 max 90 max 200 max 200 max 240 max	volts volts watts watts ma volts volts
Typical Operation and Characteristics.	;	
Plate Supply Voitage	300	volts
Grid-No.1 (Control-Grid) Voltage	300	volts
Peak AF Grid-No.1 Voltage.	10	volts
Zero-Signal Plate Current.	9 1	ma
Maximum-Signal Flate Current	္က	EC .
Maximum-Signal Grid-No.2 Current.	12.0	ma
Plate Resistance (Approx.)	29000	ohms
Transconductance	10200	umhos opma
Total Harmonic Distortion	13	per cent
Maximum-Signal Power Output	11	watts
· · ·		

Grid-No.1-Circuit Resistance: For fixed-bias operation For cathode-bias operation Maximum Circuit Values:

PUSH	PULL	PUSH-PULL CLASS AB, AMPLIFIER	AB, AM	PLIFIER			
Maximum Ratings, (Same as for Class A, Amplifier)	A. An	nplifier}				Cathode	
Typical Operation (Values are for two tubes):	ubes):		Fixed Bias	Bias		Bias	
Plate Supply Voltage	300	350	400	450	450	450	volts
Grid-No.2 Supply Voltage.	300	350	350	350	400	400	volts
Grid-No.1 Voltage	12.5	-15.5	-16	-16.5	-21	1	volta
Cathode-Bias Resistor (Common							
to both cathodes)	ŀ	ı	1	I	ı	40	ohma
Peak AF Grid-No.1-to-Grid-No.1							
Voltage	25	31	32	89	42	55	volts
Zero-Signal Plate Current	7	72	64	9	40	98	611
Maximum-Signal Plate Current.	116	130	135	142	145	6	80
Zero-Signal Grid-No.2 Current.	9	9.5	∞	7.2	ı	10	Ę
Maximum-Signal Grid-No.2 Current.	28	32	28	26	30	20	ec.
Effective Load Resistance							
(Plate-to-plate)	0099	0099	0099	0099	0099	10000	ohms
Total Harmonic Distortion.	c	2 5			rc.	2	Der cent
Maximum-Signal Power Output 24	54	30			44	80	watts

Grid No.2 of Barh Tuhe Connected to Tap on Plate Winding of Output Transformer*	to Tap former*	
Maximum Ratings: (Same as for Class A, Amplifier)	Fixed	Cathode
Typical Operation (Values are for two tubes):	Bias	Bras
Plate Supply Voltage.	400	425
Grid-No.2 Supply Voltage	*	*
Grid-No.1 Voltage	-20.5	I
Cathode-Bias Resistor (Common to both cathodes).	ı	185
Peak AF Grid-No.1-to-Grid-No.1 Voltage	41	42
Zero-Signal Plate Current	9	00
Maximum-Signal Plate Current.	115	100
Zero-Signal Grid-No.2 Current.	œ	12
Maximum-Signal Grid-No.2 Current.	18	16
Effective Load Resistance (Plate-to-plate).	0099	0099
Total Harmonic Distortion	64 10	3.5
Maximum-Signal Power Output	66	-6

volts
volts
ohms
volts
ma
ma
ma
ma
ma
ma

per cent

In push-pull circuits where the grid No.2 of each tube is connected to a tap on the plate winding of the output transformer, this maximum rating is 440 volts.

• Grid No.2 input may reach 6 watts during peak levels of speech and music signals.

O The de component must not exceed 100 volts.

* Grid No.2 supply voltage is obtained from taps on the primary winding of the output transformer. The taps are located one eath side of the center tap (B+) so as to apply 50 per cent of the place signal voltage to the grid No.2 of each output tube.

= Technical Data

0 10 10 0 GRID-No.1 VOLTS AVERAGE CHARACTERISTICS PLATE VOLTS ď TYPE 7868 E4 * 6.3 YOLTS GRID -- No.2 VOLTS = 300 8

PLATE (Ib) OR GRID-No.2 (IC2) MILLIAMPERES

≖಄

megohm megohm

0.3 max 1 max

ELECTRON-RAY TUBE

92CM-11075T

changes in a controlling voltage. Tube used to indicate visually by means of a fluorescent target the effects of

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Miniature type with triode unit is used for accurate tuning or modu-

6FG6 EM84/

may be mounted in any position. Heater volts (ac/dc), 6.3; amperes, 0.27. For adheight, 2-13/32 inches; diameter, 7/8 inch. Tube requires nine-contact socket and ditional considerations, refer to Tuning Indication with Electron-Ray Tubes in lation control. Maximum dimensions: over-all length, 2-27/32 inches; seated ELECTRON TUBE APPLICATIONS SECTION

INDICATOR SERVICE Maximum and Minimum Ratings, (Design-Center Values):

fraue in the second of the sec			
RAY-CONTROL-ELECTRODE VOLTAGE: Without current flowing through series triode-plate resistor. With current flowing through series triode-plate resistor.	: : :	550 max 300 max	volts volts
FIUORESCENT-TARGET VOLTAGE: Without current flowing through series triode-plate resistor. With current flowing through series triode-plate resistor.	: :	550 max 300 max	volts volts
CATHODE CURRENT. TRIODE-PLATE DISSIPATION. PEAK HEATER-CATHODE VOLVAGE:		1.50 min 3 max 0.5 max	volts ma watt
Heater negative with respect to cathode Heater positive with respect to cathode BUJA TEMPERATURE (At hottest point)		100 max 100 max 120 max	volts volts
Trio	Plate:	o o	;
	250	250	volta
Series Triode-Flate Hesistor. 0.47 Triode-Grid Supply Voltage. 0	47 0	0.47 -22	megohm volts
Triode-Grid Registor	es 1	60 5	megohms

		Maximis Crassis Value
	1	registor is 0 ohms. 0.94 ± 0.20
		Length of Dark Part of Fluorescent Target when triode-grid
	0	Length of Dark Part of Fluorescent Target
	1.6	Fluorescent-Target Current.
	90.0	Thode-Plate Current.
me	es	Inode-Grid Resistor.
	-25	Triode-Grid Supply Voltage,
ŭ	0.47	Series Triode-Plate Resistor.
	250	Fluorescent-Target Voltage.
	062	Transfer and Supply Voltage

Ë ma inch 3 max megohms

inch

RCA Picture Tube Characteristics*

Type			Facephate	Sorten Size Inches	T E	Į		Yellogo	į	(Amada b) <	H
Black-and-White		Typės									
5TP4	0	Yes	CĽ	41/2 Dia.	ы	M	Š.	Cavity Cap	12C	27000	Š
7,194	©	No	占	6 Dia.	ы	妇	Ξ	Base Pin	14R	0009	ž
50P4	0	ŝ	ž	7% x 5%	ы	W	8	Cavity Cap	12AB	8000	ž
108P4A	٥	ž	5	91/8 Dia.	Z	M	20.	Cavity Cap	12N	12000	Ž
10FP4A	©	χa	ñ	91/8 Dia.	×	M	50*	Carity Cap	12N	12000	ž
12KP4A	©	Yes	Đ.	11 1/5 Dia.	×	¥	54e	Cavity Cap	12N	12000	£
12LP4A	©	No	FG	11 Dia.	×	M	2	Cavity Cap	12N	12000	× ×
14ATP4P	٥	Y.	FG	121/6 x 91/2	ы	×	8	Cavity Cap	12T	14000	ž
14674	<u></u>	Š	Ģ.	11½ x 8%	×	×	70	Cavity Cap	12N	14000	ž
140P4A	٥	Yes	FG	111/2 x 85/8	ы	×	70	Cavity Cap	121	11000	ş
TAMP	0	Ϋ́	FG	12½ x 9½	я	×	8	Cavity Cap	12L	14000	2
16AP4A	3	N _o	FG	143/s Dia.	×	×	53*	Metal Shell Lip	120	14000	, S
16DF4A	0	No	PG	14½ Dia.	×	×	996	Cavity Cap	12D	15000	25
16GP4B	8	No	FFG	143% Dia.	×	M	20.	Metal-Shell Lip	12D	14000	S X
16LP4A	@	ß	FG	14½ Dia.	×	×	520	Cavity Can	12N	14000	۶
16RP4A	Þ	Yes	Ę	13½ x 10 1/8	×	Z	70	Cavity Cap	12N	16000	Ş
16TP4	ð	No	FG	13½ x 101%	×	M	70	Cayity Cap	12N	14000	, F
16WP4A	0	Š	FG	14½ Dia.	×	×	70•	Cavity Cap	12N	16000	Ž
17BJP4	ð	Yes	FG	14% x 111%	Ø	M	8	Cavity Cap	13F	16000	Š
178P4E	Ü	Yes	PG	14% x 111%	M	×	70	Cavity Cap	12N	16000	Ye
17CDP49	Ø	Yes	PG	1434 x 11 ¹ / ₂	泊	M	110	Cavity Cap	8HR	16000	Š
17CFP4	0	Yes	FG	14% x 111%	田	×	8	Cavity Cap	12T	16000	Š
1707	Ŧ	Ŷ	FFG	14%×101/编	×	M	20	Metal-Shell Lip	12D	16000	ž
17CSP4	Ð	Yes	PC	14% x 1111/16	ы	×	911	Cavity Cap	7FA	176004	No
17CYP4	ō	χes	2	1434 x 11 ¹³ / ₂	ᆈ	M	06	Cavity Cap	12L	16600	ž
17DAP4	ø	Yes	ā	14% x 111%	ഥ	×	110	Cavity Cap	8JK	16000	Ñ
17DKP4	Φ	Yes	FG	14½×111%	M	×	110	Cavity Cap	8JR	230004	å
1700F4*	ø	Yes	Ş	143/ x 111/6	ш	×	110	Cavity Cap	7FA	17600hp	Ñ
17DRP4"	0	Yes	5	14% x 1111/6	m	×	110	Cavity Cap	8JK	176004	ž
17DSP4	0	Yes	5	14½ x 11½	M	×	110	Cavity Cap	8HR	1,8000	ž
17DXP4	Ō	Yes	PG	14% x 11%	Hait I	×	110	Cavity Cap	8JR	17600h	å
17GP4		No	FFG	143/8 x 10 ¹ 1/6	m	×	5	Metal-Shell Lip	12M	16000	8
17HP46	O	Yes	Š	14%×111/4	ш	Z	70	Cavity Cap	131	16000	S.
171P4A	<u>.</u>	Yes	PC.	14½ x 10¾	M	×	02	Cavity Cap	12L	16000	ş
170MA	0	Yes	PC.	14½ x 10¾	×	Z	20	Cavity Cap	12N	18000	ž
17TF4	×	γo	FPG	14% x 10 ¹ / ₆	M	×	2	Metal Shell Lip	12M	16000	Ş
19A8P4	٣	Yes	FG	15 1/8 x 12	ш	×	114	Cavity Cap	8.JK	20000h	ž
19AFF4	ō	Yes	PG	15¼ x 12	B	M	114	Cavity Cap	SHR	200004	ž
19AMP4*	ð	Yes	P.G	15½ x 12	ш	¥	11	Cavity Cap	8HR	17600hp	ž
19AJP4"	0	Yes	Ā	15½ x 12	ᆈ	×	114	Cavity Cap	7FA	19800fe	ž
19AP4B	3	SK K	FFG	17% Dia.	×	M	99	Metal-Shell Lip	12D	00091	2
19AUP4	ō	Yes	ģ	15½ x 12½	蹴	X	114	Cavity Cap	8HR	200004	å
19AVP4	Ō	Ϋ́с	FG	15 1/8 x 12	Ħ	M	114	Cavity Cap	SHR	23000h	ĝ
19AYP4	Ō	Yes	P.	700	ᆈ	M	114	Cavity Cap	SHR	23000h	Š
20DP4C	Ð	Yes	PG	17 × 12%	×	¥	70	Cavity Cap	12N	18000	ž
DOMEAN.	¢	Ä	Ę,	17 x 123%	K	×	7.0	Cavity Can	151	, 6000	:

Metal rectangular.	Metal round	Clear glass.	FG Filterglass.	FFG Frested Filterglass.	M Magnetic.	E Electrostatic.
	3	5	Ę	FFG	×	E
Active RCA Picture-Tube Types shown here can replace more than 300 different	types of industry picture tubes. The RCA Picture Tube Replacement and Inter-	changeability Chart is available on request.	Unless otherwise noted, all picture tubes listed have 6.3-volt, 600-milliampere		Glass rectangular.	G Glass round.
4				ł	O	(0)

the beam prior to its deflection.

Design-Center Value, unless otherwise indicated.

design-Center Value, unless otherwise indicated.

--- Picture Tube Characteristics

	1	Abminist	Faceplate	Minimum Screen Size Inches	Fession Method	Defection Method	1419 <u>8</u>	Mith Voktege Terminal	Mair	Final High-Veltage Electrode (Amedyc) c	Mercal Me
Black-and-White Types	White T	Sad.									
21AMP4A	<u></u>	Yes	5	191/6 x 151/6	M	×	8	Cavity Cap	12N	18000	Xes Xes
21 AP4	¥	No	FFG	181/8 × 1311/6	M	M	70	Metal-Shell Lip	12D	18000	Yes
21AVP4B	O	Yes	PG	191/6 x 151/6	闰	M	72	Cavity Cap	12L	20000	Yes
21 AWP4	O	Yes	PG	191/6 x 151/6	Ħ	¥	7.2	Cavity Cap	12N	18000	Ϋ́es
21CBP4A	0	Ϋ́	5	191/6 × 151/6	M	×	g	Cavity Cap	12L	20000	ž
21CQP4	O	Yes	ΡĞ	19%×15%	m	×	21	Cavity Cap	7FA	18000	z
21DEP4A	o	Yes	5	19%×15%	Ħ	×	110	Cavity Cap	SHR	20000	ž
21DFP4	O	Yes	Ŗ	19% x 151/6	H	×	110	Cavity Cap	SHR	18000	ž
21DLP4	O	Yes	FG	191/6 x 151/6	田	×	욻	Cavity Cap	12L	20000	ž
21DSP4	ō	Yes	FG	19% x 15%	臼	×	96	Cavity Cap	12L	20000₽	ž
21EP48	ō	Yes	FGa	19 % x 13 %	Z	×	2	Cavity Cap	12N	18000	X-cs
21EOP4	5	Yes	FG	19% × 15%	H	×	110	Cavity Cap	8JR	18000	ŝ
21EVP4**	Ö	Yes	ĀĞ	19% x 15%	뙤	M	110	Cavity Cap	8 JK	20000h	Š
21FAP4	ō	Yes	ā	191/6 x 151/6	ĸ	M	110	Cavity Cap	8 JR	22000h	ŝ
21FDP4	3	Yes	Ę.	19% x 15%	ĸ	M	110	Cavity Cap	8KW	20000A	No
21FP4C	Ü	Yes	FG	1938 x 1378	ы	M	70	Cavity Cap	13L	18000	Yes
21MP4	×	Š	FFG	18 1/8 x 1311/6	闰	M	7.0	Metal-Shell Lip	12M	16000	Yes
21WP4A	0	Yes	FG	173% × 135%	¥	×	20	Cavity Cap	12N	18000	×es
21XP4A	O	Yes	FG	173% x 1354	ы	M	70	Cavity Cap	12T	18000	Yes
21YP4A	Ö	Yes	FG	19% × 14%	凶	×	7.0	Cavity Cap	12L	18000	Yes
21ZP4B	Ø	Yes	PG	1916 x 143/61	×	¥	70	Cavity Cap	12N	18000	Yes
23AHP4	Ö	Yes	PG	1934 x 1514	ы	M	95	Cavity Cap	121	22000h	No
23ALP4 ^k	ð	Yes	FG	19½ × 15⅓	Œ	M	114	Cavity Cap	8HR	22000t	ž
23BJP4	O	Yes	FG.	1914 x 151%	Ħ	×	85	Cavity Cap	12[25000hp	ŝ
23BKP4	ď	Yes	FG	19% x 151%	B	M	26	Cavity Cap	12T	25000hp	No
23BLP4	5	Yes	FG	19% x 151/4	Э	M	45	Cavity Cap	12L	25000%	ν
23CP4	Ę.	Yes	PG	7/51 x 9/61	E	M	110	Cavity Cap	8HR	22000h	No
23EP4	Ġ	Yes	PG	19% x 1514	闰	M	110	Cavity Cap	HKP	22000hp	8
23FP4A	Ö	Yes	P.	19½ × 15½	ъ	M	114	Cavity Cap	SHR	23500 ^k	Ň
23.JP4k	ē	Yes	FG	195/6 x 153/4	×	W	27	Cavity Cap	7FA	22000%p	ž
23YP4	0	Yes	FG	19% x 1514	Œ	M	93	Cavity Cap	12 L	22000h	Ñ
24AEP4	C	Yes	FG	217/6 x 167/8	ы	M	6	Cavity Cap	12L	20000	Š
24AHP4	0	Yes	FG	21% x 16%	M	Z	041	Cavity Cap	SHR	20000	ž
24ATP4	Ō	Yes	FG	31½ x 16½	E	×	8	Cavity Cap	12E	20000	ž
24AUP4	3	Yes	P.G	21% x 16%	м	×	8	Cavity Cap	121	20000	ž
24BAP4	ø	Yes	FG	21% x 16%	ы	Z	≘.	Cavity Cap	SHR	20000P	å
24CP4A	ō	Yes	FG	21% x 167%	×	×	8	Cavity Cap	12N	20000	Ϋ́в
27.MP4	3	Yes	PPG	23% x 181/8	Z	×	8	Metal-Shell Lip	120	18000	ž
27RP4	0	Yes	FG	24½ × 18%	Z	×	8	Cavity Cap	12N	20000	Yes
Color Types	#										
15GP22"	[× ×	ಕ	11½x 85%	Ħ	×	\$	Metal Flange	20A	20000	ž
21AXP22A	3	Yes	2	19% x 151/4	泊	×	92	Metal Shell	14AH	25000	Ñ
21CYP22A"	(4)	Yes	ā	19½ x 15½	E	Z	20.	Two Cavity Caps	14AL	25000	ž
21FBP22'	0	Yes	FG	19¼ x 15½	ন	×	ş	Cavity Cap	14AU	27500h	ž
	0	;		/100							

,	dc/in.) for	[
Horizontal deflection angle.	Typical deflection factors (votta de/in.) for ultor voitage of 6000 votts:	11.00
٠	•	

13.1 & 30.5 (merre zapten) (3.1 a. 20.4 (manur hamp)) (3.1 a. 20.5 (merre hamp)) (3.1 a. 20.5 (merre hamp))

9. 8.4-volt, 459-miliamperc heater, h. Design-Maximum Value, j. 2.68-volt, 450-miliampere heater,

For basing diagrams, see page 486.

6.3-volt, 450 milliampere heater.
 Popindried faceplate.
 Meganst type.
 Meganst type.
 Medanst faceplate.
 Meganst type.
 Medanst faceplate.
 Medanst faceplate.
 Medanst faceplate.
 Medanst faceplate.
 Medanst faceplate.
 Treated to reduce specular reflection.
 Tals-volt, 600-milliampere heater.

r This type has a flet, aluminized, filterglass, physicity care to plate;

43.001, J. Banaper Destre (three heaters predicted mercandy).

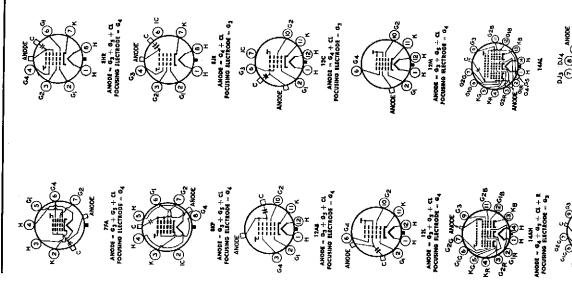
20.001, J. Banaper Destre (three heaters predicted mercandy).

20.001, J. Banaper Destre (three heaters predicted mercandy).

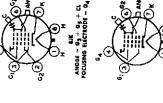
* This type has an internal magnetic rided.

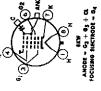
This type has an internal magnetic rided.

Basing Diagrams for RCA Picture Tubes















age Supply to this Cap are un-cenned. 50,000 - shar resists between this Cap and the Ca ware Pin No. 1. CAP OVER MIN No. 1 AP OVER PIN No. 2

OCUSING ELECTRODE = Q.



ANODE = $a_5 + a_6 + c_1$ FOCUSING ELECTRODE = a_3

ANOBE = 62 + 64 + CL FOCUSING BLECTRODE = 63

ANODE = 04 + 03 + CL POCUSING ILECTRODE = 63

Electron Tube

The electron tube user-service radio listener—is interested in knowing which they are used. In order to determine the condition of a tube, some a tube is tested by measuring its characteristics and comparing them with val-Tubes which read abnormally high with govern the performance of the device in method of test is necessary. Because the operating capabilities and design fearespect to the standard for the type are subject to criticism just the same as man, experimenter, or non-technical the condition of his tubes, since they tures of a tube are indicated and described by its electrical characteristics, ues established as standard for that type. tubes which are too low.

These limitations Certain practical limitations are placed on the accuracy with which a make it impractical for the service man testing device need be no greater than teristics are virtually fixed by the manuufacturers, it is possible to employ a relatively simple test in order to deterand dealer to employ complex and costly curacy. Because the accuracy of the tubethe accuracy of the correlation between and since certain fundamental characfacturing technique of leading tube mantube test can be correlated with actual testing equipment having laboratory actest results and receiver performance, mine the serviceability of a tube. tube performance.

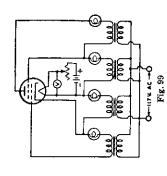
In view of these factors, dealers and simplicity of operation by employing a single characteristic. Whether the tube teristic. Consequently, it is very desirable that the characteristic selected for the test be one which is truly representative is satisfactory or unsatisfactory is judged from the test result of this single characservice men will find it economically expedient to obtain adequate accuracy and device which indicates the status of of the tube's over-all condition.

cuits are given to describe and illustrate general theoretical and practical tube-The following information and cir-

tester considerations and not to provide nformation on the construction of a the problem of determining what tube ticular tester. Getting information of this nome-made tube tester. In addition to receivers, the designer of a home-made tester faces the difficult problem of decharacteristic is most representative of performance capabilities in all types of termining satisfactory limits for his parnature, if it is to be accurate and useful, is a big job. It requires the testing of many tubes of each type, testing of many types, and correlation of the data with perormance in many kinds of equipment

Short-Circuit Test

though this circuit is suitable for tetrodes trodes, tubes of more electrodes may be tested by adding more indicator lamps tween the various electrodes with lamps in series with the electrode leads. The to the circuit. Voltages are applied be-The fundamental circuit of a shortcircuit tester is shown in Fig. 99. Aland types having less than four elecvalue of the voltages applied will depend



on the type of tube being tested and its or more lamps. Since two electrodes may lamps operate on very low current. It is also desirable to maintain the filament maximum ratings. Any two shorted electrodes complete a circuit and light one be just touching to give a high-resistance short, it is desirable that the indicating

or heater of the tube at its operating tivity may indicate very-high-resistance temperature during the short-circuit test, because short-circuits in a tube may sometimes occur only when the electrodes are heated. However, a shortcircuit tester having too high a sensishorts that do not adversely affect tube operation.

Selection of a Suitable Characteristic for Test

Some characteristics of a tube are far ating worth than are others. The cost of be considerably higher than that of a device which measures a less representative characteristic. Consequently, three more important in determining its operbuilding a device to measure any one of methods of test will be discussed, rangsive equipment to more elaborate, more the more important characteristics may ing from relatively simple and inexpenaccurate, and more costly devices.

simplest method of indicating a tube's falls off as the tube wears out, low emistest is subject to limitations because it tual operation of the tube. On the one An emission test is perhaps the TRON TUBES SECTION, for a discussion of electron emission.) Since emission sion is indicative of the end of tube serviceability. However, the emission tests the tube under static conditions and does not take into account the acthe emission is so great that the relaalthough the tube is unsatisfactory. On the other hand, coated types of filaments condition. (Refer to Diodes, in ELEC-TRONS, ELECTRODES, AND ELEChand, coated filaments, or cathodes, often develop active spots from which tively small grid area adjacent to these spots cannot control the electron stream. Under these conditions, the total emission may indicate the tube to be normal are capable of such large emission that the tube will often operate satisfactorily after the emission has fallen far below the original value.

cuit diagram for an emission test. All of the electrodes of the tube, except the cathode, are connected to the plate. The filament, or heater, is operated at rated voltage; after the tube has reached con-Fig. 100 shows the fundamental cir-

a particular tube type indicate that the total number of available electrons has been so reduced that the tube is no stant temperature, a low positive voltage is applied to the plate and the electron emission is read on the meter. Readings which are well below the average for onger able to function properly.

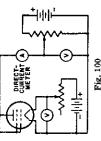
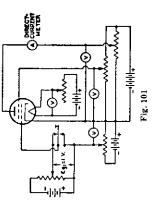


Fig. 100

transconductance test takes principle of the tube. (This fact will be lows that transconductance tests, when properly made, permit better correlation seen from the definition of transconductance in the Section on ELECTRON TUBE CHARACTERISTICS.) It folbetween test results and actual performance than does a straight emission test. account a fundamental operating

ductance test which can be utilized in a tube tester. In the first form (illustrated by Fig. 100 giving a fundamental circuit with a tetrode under test), appropriate There are two forms of transconoperating voltages are applied to the



electrodes of the tube. A plate current depending upon the electrode voltages tained. The difference between the two the transconductance of the tube. This will then be indicated by the meter. If the bias on the grid is then shifted by plate-current readings is indicative of the application of a different grid voltage, a new plate-current reading is ob-

method of transconductance testing is od, and depends on readings under static conditions. The fact that this form of commonly called the "grid-shift" methtest is made under static conditions imposes limitations not encountered in the second form of test made under dynamic conditions.

applied to the grid. Thus, the tube is The dynamic transconductance test Illustratedin Fig. 102 gives a fundamental circuit with a tetrode under test. This conductance test in that ac voltage is tested under conditions which approximate actual operating conditions. The conductance of the tube is equal to the method is superior to the static transalternating component of the plate current is read by means of an ac ammeter of the dynamometer type. The trans-

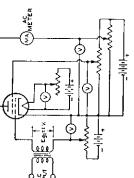


Fig. 102

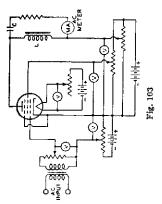
ac plate current divided by the inputis applied to the grid, the plate-currentmeter reading in milliamperes multiplied by one thousand is the value of signal voltage. If a one-volt rms signal gransconductance in micromhos.

results and actual operating performance set up, the power-output test will give The power-output test probably gives the best correlation between test of a tube. In the case of voltage amplifiers, the power output is indicative of the amplification and output voltages obtainable from the tube. In the case of quently, although more complicated to power-output tubes, the performance of closer correlation with actual performthe tube is closely checked. Conseance than any other single test.

trates the method for a pentode. The ac output voltage developed across the operation of tubes. The diagram illuscuit of a power-output test for class A Fig. 103 shows the fundamental cir-

plate-load impedance (L) is indicated by the current meter. The current meter is isolated as far as the dc plate current is concerned by the capacitor (C). The power output can be calculated from the

Electron Tube Testing

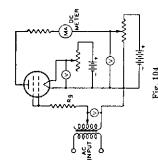


ance. In this way, it is possible to determine the operating condition of the tube current reading and known load resistquite accurately.

plied to the grid of the tube, the current Fig. 104 shows the fundamental circuit of a power-output test for class B operation of tubes. With ac voltage apin the plate circuit is read on a dc milliammeter. The power output of the tube is approximately equal to:

 $({
m Ib}^2 imes {
m R}_{\rm L})/0.405,$

In is the de current in amperes, and R. where Po is the power output in watts. is the load resistance in ohms.



Essential Tube-Tester Requirements

1. The tester should provide for making a short-circuit test before measurement of the tube's characteristics.

2. It is important that some means of controlling the voltages applied to the electrodes of the tube be provided. If the tester is ac operated, a line-voltage con-

trol permits the supply of proper electrode voltages.

age applied to the filament or heater be 3. It is essential that the rated voltmaintained accurately.

scribed. The method selected and the 4. It is suggested that the characteristics test follow one of the methods dequality of the parts used in the test will depend upon the user's requirements.

Tube-Tester Limitations

indication of a tube's worth. cate the difference between a given tube's A tube-testing device can only indi-

ard for that particular type. Since the operating conditions imposed upon a tube of a given type may vary within wide limits, it is impossible for a tubetesting device to evaluate tubes in terms of performance capabilities for all applications. The tube tester, therefore, canin determining whether or not a tube is test in the equipment in which the tube is to be used will give the best possible not be looked upon as a final authority always satisfactory. Actual operating characteristics and those which are stand-

Resistance-Coupled Amplifiers

Resistance-coupled, audio-frequency voltage amplifiers utilize simple compo nents and are capable of providing esser tially uniform amplification over a rel tively wide frequency range.

Suitable Tubes

pentodes. The accompanying key to tub types will assist in locating the appro In this section, data are given for over 50 types of tubes suitable for us in resistance-coupled circuits. These type include low- and high-mu triodes, twi triodes, triode-connected pentodes, an priate data chart.

Circuit Advantages

operation with series screen-grid resistor For most of the types shown, the dat pertain to operation with cathode bias The use of a cathode-bias resistor when feasible and a series screen-grid resisto where applicable offers several advantage for all of the pentodes, the data pertain over fixed-voltage operation.

frequency at which the amplifier cuts of The advantages are: (1) effects of possible tube differences are minimized (2) operation over a wide range of plate change in gain is feasible; (3) the los is easily changed; and (4) tendency to supply voltages without appreciab ward motorboating is minimized.

Number of Stages

of a multi-stage amplifier. With proper filters, three or more amplifier stages can be operated from a single power-supply unit of conventional design without encountering any difficulties due to coupling These advantages can be enhanced by the addition of suitable decoupling filters in the plate supply of each stage

	Chart No.	∞ ro	6	00 00		1.0	000	2	က	œ	тĊ	4	2	က	6			6	6	1	3	∞		6	9	7	ტ	12	13			
	ą	2	2			Ę	SNIGTB		-	_	و	7	16	17.A	9			2	7. A	2	7 GT	SN7GTA		7	٥.	_		٥	_			
	Type	6CG7 6CN7	6EU7	6FQ7 6J5		T57.188	6SN	6T8A	7AU7	8CG	12AT6	12AT7	12AU6	12AU7.	12AV			12AX7	12AX7.	12AY7	12SL7GT	12SN		20EZ7	5879P	5879T	7025	7199P	7199T			
	Chart No.	21 00	11	2 =		6	1 =	01	10	11	10	10	5	4	11			5	61	o,	=	10		10	10	တ	11	11	11		-	
	Š							¥			¥	Ą.							₽.			ш		-41!				Ą				
	Type	3AU6	3BC5	3CB6 3CF6		44116	4BC5	4BQ7.	4BZ7	4CB6	5BK7A	5BQ7	5T8	6AB4	6AG5			6AT6	6AU6A	6AV6	6BC5	6BK7B		6BQ7A	6BZ7	6C4	6CB6	9ECB6	6CF6			
٠ خ	<u> </u>	ď		or	- Se	g.g	pu	pe	ģ		<u> </u>		ţ0 ;	Ħ	i.e	ş	82		ot	۵;	ф	le I	¥ #	: 6				,	줐	<u>م</u>	<u>е</u>	•

T=Triode Unit or Triode Connection P≃Pentode Unit or Pentode Connection

through the power unit. When decoupling off. filters are not used, not more than two whi stages should be operated from a single belo power-supply unit.

Symbols Used in Resistance-Coupled Amplifier Charts

 $C = Blocking Capacitor (\mu f).$ $C_k = Cathode Bypass Capacitor (\mu f).$

 $C_{g_2} =$ Screen-Grid Bypass Capacitor (μ).

 $E_{bb} = Plate-Supply \ Voltage \ (volts).$ Voltage at plate equals plate-supply voltage minus drop in R_p and R_k .

 $\mathbf{R}_{k} = \text{Cathode Resistor (ohms)}.$ $\mathbf{R}_{kt} = \text{Screen-Grid Resistor (megohms)}.$

 $R_{\kappa} = Grid Resistor (megohms)$ for following stage.

 $R_p = Plate Resistor (megohms).$ V.G.= Voltage Gain.

= Output Voltage (peak volts).

= Output Voltage (peak volts).

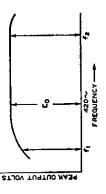
This voltage is obtained across

R_g (for following stage) at any frequency within the flat region of the output vs. frequency curve, and is for the condition where the signal level is adequate to swing the grid of the resistance-coupled amplifier tube to the point where its grid starts to draw current.

Note: The listed values for E, are the peak output voltages available when the grid is driven from a low-impedance source. The listed values for the cathode resistors are optimum for any signal source. With a high-impedance source, protection against severe distortion and loss of gain due to input loading may be obtained by the use of a coupling expactor connected directly to the input grid and a high-value resistor connected between the grid and ground.

General Circuit Considerations

In the discussions which follow, the frequency (f_2) is that value at which the high-frequency response begins to fall



off. The frequency (f,) is that value at which the low-frequency response drops below a satisfactory value, as discussed below. A variation of 10 per cent in values of resistors and capacitors has only slight effect on performance. One-half-watr resistors are usually suitable for Res. Re, Re, and R_k resistors. Capacitors C and C_{g,s} should have a working voltage equal to or greater than E_{bb}. Capacitor C_k noy have a low working voltage in the order of 10 to 25 volts.

Triode Amplifier Heater-Cathode Type

Capacitors C and C_k have been chosen to give an output voltage equal to 0.8 E_o for a frequency (f_i) of 100 cycles. For any other value of f_i, multiply values of C and C_k by 100/f_i. In the

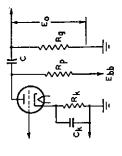


Diagram No. 1

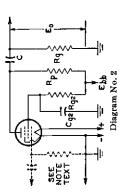
ciated circuit, the gain, and the value heater excitation; when ac is used, deof f₁, it may be necessary to increase the The voltage output at f. of "n" like stages equals $(0.8)^n \times E_o$, where E_o is case of capacitor Ck, the values shown in the charts are for an amplifier with dc pending on the character of the assovalue of Ck to minimize hum disturbances. It may be desirable to operate the heater at a positive voltage of from 15 to 40 volts with respect to the cathode. the peak output voltage of final stage. For an amplifier of typical construction, the value of f₂ is well above the audiofrequency range for any value of Rp.

Pentode Amplifier Filament-Type

Capacitors C and C_{g2} have been chosen to give an output voltage equal to $0.8 \times E_0$ for a frequency (f₁) of 100

= Resistance-Coupled Amplifiers

cycles. For any other value of f_1 , multiply values of C and C_{g_2} by $100/f_1$. The voltage output at f_1 for "n" like stages equals $(0.8)^n \times E_o$ where E_o is peak output voltage of final stage. For an amplifier of typical construction, and for R_o values of 0.1, 0.25, and 0.5 megohm, approximate values of f_4 are 20000, 10000, and 5000 cps, respectively. Note: The

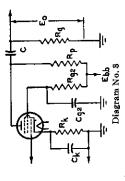


values of input-coupling capacitor in microfarads and of grid resistor in megohms should be such that their product lies between 0.02 and 0.1. Values commonly used are 0.005 μ f and 10 megohms.

Pentode Amplifier Heater-Cathode Type

Capacitors C, C_k , and C_{gz} have been chosen to give an output voltage equal to $0.7 \times E_o$ for a frequency (f.) of

100 cycles. For any other value of f_1 , multiply values of C_1 , G_2 , and G_{g^2} by 100/ f_1 . In the case of capacitor G_k , the values shown in the charts are for an amplifier with dcheater excitation; when



ac is used, depending on the character of the associated circuits, the voltage gain, and the value of f_i , it may be necessary to increase the value of C_k to minimize hum disturbances. It may be desirable to operate the heater at a positive voltage of from 15 to 40 volts with respect to the cathode. The voltage output at f_i for "n" like stages equals $(0.7)^n \times E_o$ where E_o is peak output voltage of final stage. For an amplifier of typical construction, and for R_p values of 0.1, 0.25, and 0.5 megohm, approximate values of f_a are 20000, 10000, and 5000 cps, respectively.

(See page 492 for explanation of column headings)

\mathbf{E}_{bb}	R	Rg	Rg2	꾟	$C_{\mathbf{g},2}$	č	င	*°E	V.G.
	[:	0.24	-	1800	1	•	'	13	ž
8	0.24	0.51	1	3700	ŀ	,	•	=	56
	0.51	1.0	1	7800	ı	:	ι	16	27
	0.1	0.24	,	1300	,	,	١	31	27
180	0.24	0.51	1	2800	,	,	1	33	R
	0.51	1.0	ı	5700	t .	1	ı	33	30
	0,1	0.24	ļ .	1200	1	,	,	27	38
300	0.24	0.51	 !	2300	·	,		8	8
	0.51	1.0	1	4800	ı	,	ŧ	36	31

One triode unit. * Peak volts.

4 Coupling capacitors should be selected to give desired frequency response. Cathode resistors should be adequately bypassed.

12AY7 See Circuit Diagram 2

(See page 492 for explanation of column headings)

V.G.

Eo*

79 104 125

16 22 25

105 137 161

13 17 25

139

2 61

143 192 223

33. 48. 48.

0.0081 0.0053 0.0032

8.8

0.22

189 249 294

34 43 50

0.0041 0.0027 0.0019

5.5 5.4 5.4

230 323

33

0.0023

3.2

0.0042 0.0027 0.0019 0.0025 0.0081 0.0055 0.0034 Ų ť ი. გ. გ. დ. 4. ნ. 2.8 2.7 2.8 1.7 0.027 0.023 0.027 $C_{\mathbf{g}_2}$ 0.057 0.050 0.050 0.017 2700 2900 3100 6000 6200 6300 10800 ž Rg2 0.340 0.370 0.380 8 6 8 1.90 ស្ន 0.22 0.47 1.0 0.47 1.0 2.2 1.0 $\mathbf{R}_{\mathbf{p}}$ 0.22 0.47 0.1 **E**bb 8 3AU6 4AU6 6AU6A 12AU6 (4)

0.059 0.059 0.059 0.039 0.037 0.036 0.028 0.077 0.077 0.077 0.057 0.049 0.045 0.036 1340 1390 1420 2700 2880 2960 5500 6000 1590 1650 1720 3300 780 783 800 0.520 0.520 0.520 0.530 0.540 0.540 1.05 1.15 1.20 2.40 2.50 1.15 1.22 1.31 0.47 1.0 2.2 0.22 0.47 1.0 0.22 0.47 1.0 0.47 1.0 2.2 $\frac{1.0}{2.2}$ 1.0 0.47 0.220.47 1.0 1.0 180 300

See Circuit Diagram 3

275 357 418

56 72 82

0.0045 0.0027 0.0017

8.4 7.4 7.2

352 466

57

0.0022

5.3

200 270 316

53 74

0.0082 0.0053 0.0033

13.2 13.2 13.1

ſ					Į			
0.04	7	1	1600	ı	3.2	0.061	6	2
0.1		1	1800	ı	5.5	0.033	=	11
0.22		1	2000	1	2.0	0.015	14	Ξ
0.1		1	3000	-	1.6	0.032	2	12
0.22	_	1	3800	ı	-:	0.015	15	=
0.47		1	4500	ı	1.0	0.007	82	=
0.22		1	0089		0.7	0.015	14	Ξ
0.47		1	9200	'	0.5	0.0065	20	<u>-</u>
1.0		ı	11500	1	0.43	0.0035	24	11
0.047		1	920	-	3.9	0.062	20	=
0.1		ı	1200	ı	2.9	0.037	26	12
0.22		ı	1400	1	2.5	910.0	29	12
0.1		ı	2000	ı	1.9	0.032	24	12

6C4 7AU7• 12AU7A•

m

		5	1	200	ı -	*	50.5	>	
	0.047	0.1	1	1800	ı	5.5	0.033	Ξ	
		0.22	1	2000	1	2.0	0.015	14	
	İ								
		0.1	1	3000	ı	1.6	0.032	2	
8	0.1	0.22	ı	3800	ı		0.015	15	
		0.47	ı	4500	ı	1.0	0.007	82	
		0.22	ı	0089	,	0.7	0.015	14	1
	0.22	0.47	ı	9200	,	0.5	0.0065	50	
		1.0	1	11500	1	0.43	0.0035	24	
		0.047	1	920	 	3.9	0.062	20	'
	0.047		ı	1200	ı	2.9	0.037	26	
		0.22	ı	1400	1	2.5	910.0	29	
		0.1	ı	2000	1	1.9	0.032	24	
180	:	0.22	ı	2800	•	1.4	0.016	33	
		0.47	ı	3600	ı	1.1	0.007	40	
		0.22	ı	5300	1	8.0	0.015	31	-
	0.22	0.47	ı	8300	•	0.56	0.007	4	
		1.0	ı	10000	ı	0.48	0.0035	54	-
		0.047	,	870	ı	4.1	0.065	38	_
	0.047	0.1	ı	1200	1	3.0	0.034	25	
		0.22	ŀ	0051	1	2.4	0.016	89	_
		0.1		1900	1	1,9	0.032	4	
300	0.1	0.22	1	3000	ı	1.3	0.016	8	_
		0.47	ı	4000	ı	1,1	0.00	80	_
		0.22	١,	5300	,	6.0	0.015	57	-
	0.22	0.47	ı	8800	ı	0.52	0.007	82	_
		0.1	t	11000	ı	0.46	0.0035	93	_

See Circuit Diagram 1

*Peak volts. One triode unit.

Resistance-Coupled Amplifiers =

(See page 492 for explanation of column headings)

Bob	₩ d	Rg	Rg2	Ŗ	Cg2	ŏ	ပ	ж°	V.G.
	0.1	0.1	ι 1	2680 3060	1 1	2.4	0.026	8	24
		0.47	ı	3390	ı	1.84	0.0074	13	38
		0.22	1	5500	1	1.33	0.0136	10	25
8	0.22	0.47	ı	6300	1	101	0.0067	14	28
		1.0	t	6930	1	0.92	0.0038	15	38
		0.47	-	10900	-	0.63	0.007	13	26
	0.47	1.0	1	12500	ı	0.52	0.0043	14	28
		2.2	1	13500	1	0.47	0.0031	18	78
		0.1	-	1407	,	3.6	0.029	20	31
	0.1	0.22	1	1674	t	3.0	0.016	78	33
		0.47	1	1786	į	2.6	0.0083	31	34
•		0.22	ı	2890	ı	1.75	0.0140	24	33
180	0.22	0.47	ı	3860	1	1.34	0.0077	35	33
		1.0	ı	4660	1	1.14	0.0047	42	33
		0.47	-	0969	-	0.83	0.0075	31	31
	0.47	1.0	ı	8450	1	0.67	0.0046	39	32
		2.2	ł	9600	1	0.55	0.0032	45	32
		0,1	1	974	-	4.0	0.028	37	34
	0.1	0.22	1	1404	1	3.1	0.015	57	34
		0.47	1	2169	ı	2.5	0.0083	78	33
		0.22	1	2510	-	1.9	0.015	20	33
300	0.22	0.47	ı	4200	1	1.3	0.0074	78	33
		1.0	1	4950	t	1.1	0.0046	82	32
		0.47	1	5700	-	0.90	0.0076	57	33
	0.47	1.0	ı	8720	1	0.62	0.0041	81	32
		2.2	ı	9700	1	0.57	0.0030	88	32
					J				

See Circuit Diagram 1

6AB4 12AT7

2 - 4200 - 2.5 0.014 5.4 7 - 4800 - 2.0 0.0045 9.1 7 - 7000 - 1.3 0.007 1.0 7 - 7000 - 1.1 0.0035 1.2 7 - 12000 - 0.7 0.005 1.4 - 15000 - 0.7 0.005 1.4 - 15000 - 0.7 0.005 1.4 - 15000 - 0.0 0.004 1.6 - 15000 - 2.2 0.014 2.4 - 2200 - 2.2 0.014 2.4 - 4100 - 1.7 0.0065 3.3 - 4500 - 1.5 0.0035 3.8 - 1800 - 1.5 0.0055 3.9 - 1800 - <th>L</th> <th></th> <th>,</th> <th></th> <th>****</th> <th></th> <th></th> <th></th> <th></th> <th>ľ</th>	L		,		****					ľ
0.22 - 4600 - 2.2 0.014 7.5 0.47 - 4800 - 2.0 0.0065 9.1 0.47 - 7800 - 1.3 0.003 1.3 1.0 - 8100 - 1.1 0.0035 1.0 1.0 - 14000 - 0.7 0.005 10 2.2 - 15000 - 0.6 0.002 16 0.1 - 15000 - 0.6 0.002 16 0.2 - 1500 - 0.6 0.002 16 0.4 - 1500 - 3.1 0.014 25 0.4 - 1500 - 3.2 0.003 16 0.4 - 1500 - 1.7 0.005 3.8 0.4 - 4600 - 1.1 0.005 3.8 1.0 - 8				t	4200	ı	2.5	0.025	*	77
0.47 4800 2.0 6.0065 9.1 0.22 7000 1.5 0.013 7.3 0.47 8100 1.1 0.0057 10 1.0 8100 0.83 0.006 10 2.2 14000 0.7 0.0055 16 2.2 15000 0.7 0.0055 16 0.1 14000 0.7 0.0055 16 0.22 15000 3.6 0.027 16 0.47 1500 2.2 0.014 24 0.47 4500 1.7 0.0055 33 1.0 4500 1.5 0.0055 34 1.0 4600 1.5 0.0055 43 0.1		-	0.22	ı	4600	ı	2:3	0.014	7.5	27
0.22 - 7000 - 1.5 0.013 7.3 1.0 - 8100 - 1.1 0.0035 11 1.0 - 12000 - 0.1 0.005 10 2.2 - 15000 - 0.7 0.005 16 2.2 - 15000 - 0.6 0.005 16 0.1 - 15000 - 0.6 0.005 16 0.2 - 1500 - 3.1 0.014 25 0.47 - 1500 - 3.1 0.014 24 0.47 - 100 - 1.7 0.005 3.2 0.47 - 4100 - 1.7 0.005 3.3 1.0 - 4600 - 1.1 0.0065 3.3 1.0 - 18100 - 1.5 0.0035 3.8 1.0 - <td< td=""><td></td><td></td><td>0.47</td><td>ŧ</td><td>4800</td><td>1</td><td>2.0</td><td>0.0065</td><td>9.1</td><td>30</td></td<>			0.47	ŧ	4800	1	2.0	0.0065	9.1	30
0.47 - 7800 - 1.3 0.007 10 1.0 - 8100 - 1.1 0.0035 12 0.47 - 14000 - 0.7 0.005 14 2.2 - 15000 - 0.6 0.0035 14 0.1 - 15000 - 0.6 0.0035 16 0.21 - 2200 - 3.1 0.014 25 0.47 - 2500 - 2.2 0.014 24 0.47 - 4600 - 1.7 0.0065 33 1.0 - 4600 - 1.7 0.0065 34 1.0 - 4600 - 1.5 0.0035 38 1.0 - 4600 - 1.1 0.0065 39 1.0 - 1810 - 1.5 0.0035 38 2.2 - <td< td=""><td></td><td></td><td>0.22</td><td></td><td>7000</td><td>ı</td><td>1.5</td><td>0.013</td><td>7.3</td><td>30</td></td<>			0.22		7000	ı	1.5	0.013	7.3	30
1.0 — 8100 — 1.1 0.0035 12 0.47 — 12000 — 0.83 0.006 10 1.0 — 14000 — 0.7 0.0035 14 2.2 — 15000 — 0.6 0.0027 16 0.1 — 1900 — 3.6 0.027 19 0.47 — 2200 — 2.3 0.0045 3.5 0.47 — 4100 — 2.2 0.014 2.4 0.47 — 4500 — 1.7 0.0065 3.9 1.0 — 4600 — 1.5 0.0035 3.8 1.0 — 4600 — 1.1 0.0065 2.9 1.0 — 8100 — 1.1 0.0055 3.9 2.2 — 1800 — 1.4 0.005 4.4 0.005 2.2).22	0.47	1	7800	ı	1.3	0.007	2	34
0.47 - 12000 - 0.83 0.006 10 1.0 - 14000 - 0.7 0.0035 14 0.1 - 15000 - 0.7 0.002 16 0.47 - 2200 - 3.1 0.014 23 0.47 - 2200 - 2.8 0.005 32 0.47 - 4100 - 1.7 0.0065 34 1.0 - 4600 - 1.5 0.0035 38 1.0 - 4600 - 1.1 0.0065 29 1.0 - 4600 - 1.1 0.0055 38 1.0 - 8100 - 1.1 0.0055 39 2.2 - 1800 - 1.4 0.005 49 0.21 - 1100 - 3.6 0.004 40 0.22 - <td< td=""><td></td><td></td><td>1.0</td><td>ı</td><td>8100</td><td>,</td><td>=</td><td>0.0035</td><td>12</td><td>33</td></td<>			1.0	ı	8100	,	=	0.0035	12	33
1.0 - 14000 - 0.7 0.0035 114 0.1 - 15000 - 0.6 0.002 16 0.1 - 1900 - 3.5 0.027 19 0.47 - 2200 - 2.8 0.0044 3.2 0.47 - 2500 - 2.2 0.014 2.2 0.47 - 4100 - 1.7 0.0065 3.4 1.0 - 4600 - 1.1 0.0065 3.9 1.0 - 8100 - 1.1 0.0065 3.9 2.2 - 9100 - 0.9 0.0035 3.8 0.2 - 1500 - 0.1 0.005 4.3 0.2 - 1800 - 3.6 0.014 4.0 0.47 - 2100 - 2.5 0.013 5.1 0.47 -	4		0.47	1	12000	,	0.83	0.00	2	36
0.1 - 15000 - 0.6 0.002 16 0.1 - 1900 - 3.6 0.027 19 0.47 - 2200 - 2.8 0.0065 3.2 0.47 - 2500 - 2.2 0.014 25 0.47 - 4100 - 1.7 0.0065 3.2 1.0 - 4600 - 1.7 0.005 3.8 1.0 - 8100 - 1.1 0.0065 2.9 1.0 - 8100 - 1.1 0.0065 3.8 2.2 - 1100 - 1.4 0.002 4.3 0.1 - 1800 - 1.4 0.002 4.3 0.2 - 1800 - 4.4 0.002 4.3 0.47 - 1800 - 2.6 0.014 5.4 0.47 -		.47	1.0	1	14000	ı	0.7	0.0035	14	39
0.1 - 1900 - 3.6 0.027 19 0.23 - 2200 - 3.1 0.014 25 0.47 - 2500 - 2.8 0.0065 3.2 0.47 - 4100 - 1.7 0.0065 3.4 1.0 - 4600 - 1.5 0.0065 3.4 1.0 - 4600 - 1.1 0.0065 3.4 1.0 - 8100 - 1.1 0.0065 2.9 1.0 - 8100 - 1.1 0.0065 2.9 0.1 - 1800 - 0.9 0.0035 3.8 0.1 - 1800 - 4.4 0.027 40 0.47 - 2100 - 3.0 0.005 54 0.47 - 2200 - 2.5 0.013 51 0.1 -			2.2	ı	15000		9.0	0.007	16	Ŧ
0.22 2200 3.1 0.014 25 0.47 2500 2.8 0.0065 3.2 0.47 4100 1.7 0.0065 3.4 1.0 4600 1.5 0.0055 3.8 1.0 4600 1.1 0.0065 3.8 1.0 4600 1.1 0.0065 3.8 1.0 8100 1.1 0.0065 3.8 2.2 9100 0.8 0.002 4.3 0.1 1800 4.4 0.027 40 0.22 1800 3.6 0.014 54 0.47 2100 3.0 0.005 51 0.47 3200 1.6 0.005 51 0.47	•		0,1	-	1900	ı	3.6	0.027	19	92
0.47 - 2500 - 2.8 0.0065 3.2 0.22 - 3400 - 2.2 0.014 24 0.47 - 4100 - 1.7 0.0065 3.4 1.0 - 4600 - 1.1 0.0065 3.4 1.0 - 6500 - 1.1 0.0065 2.9 1.0 - 8100 - 0.9 0.0033 3.8 0.1 - 1500 - 4.4 0.027 4.9 0.22 - 1800 - 4.4 0.027 4.9 0.47 - 2100 - 3.6 0.014 54 0.47 - 2600 - 2.5 0.013 51 0.47 - 3200 - 2.5 0.013 51 0.47 - 3700 - 1.6 0.0055 65 0.1 -		1.0	0,22	ı	2200	ı	3,1	0.014	25	38
0.72 - 3400 - 2.2 0.014 24 0.47 - 4100 - 1.7 0.0065 34 1.0 - 4600 - 1.5 0.0035 34 1.0 - 6600 - 1.1 0.0065 29 1.0 - 9100 - 0.9 0.002 43 0.1 - 1800 - 4.4 0.027 40 0.22 - 1800 - 3.6 0.014 54 0.47 - 2800 - 3.6 0.015 53 0.47 - 3700 - 1.9 0.005 55 0.1 - 3700 - 1.6 0.0035 77 1.0 - 5200 - 1.6 0.0035 74 1.0 - 6300 - 1.0 0.0035 74 2.2 - 1.0 0.0035 74 0.0035 74			0.47	ı	2500	ı	8.8	0.0065	32	37
0.47 - 4100 - 1.7 0.0065 34 1.0 - 4600 - 1.5 0.0035 38 0.47 - 6600 - 1.1 0.0065 29 1.0 - 8100 - 0.9 0.002 43 0.12 - 1800 - 3.6 0.014 44 0.22 - 1800 - 3.6 0.014 44 0.47 - 2100 - 3.6 0.014 54 0.47 - 2200 - 2.5 0.013 51 0.47 - 3700 - 1.9 0.0055 65 0.1 - 2300 - 1.6 0.0035 77 1.0 - 2300 - 1.6 0.0035 74 2.2 - 2300 - 1.0 0.0035 74 2.2 - 0			0.22	'	3400	١.	2.2	0.014	24	89
1.0 - 4600 - 1.5 0.035 38 0.47 - 6600 - 1.1 0.0665 29 1.0 - 8100 - 0.9 0.0035 38 2.2 - 9100 - 0.9 0.003 43 0.1 - 1800 - 44 0.027 40 0.47 - 1800 - 3.6 0.014 54 0.47 - 2100 - 2.5 0.013 51 0.47 - 3200 - 1.9 0.065 65 0.1 - 3700 - 1.6 0.0055 65 0.1 - 2300 - 1.6 0.0055 65 0.1 - 2300 - 1.6 0.0055 67 1.0 - 2300 - 1.6 0.0055 74 2.2 - 1.0 <td></td> <td>0.32</td> <td>0.47</td> <td>ı</td> <td>4100</td> <td>1</td> <td>1.7</td> <td>0.0065</td> <td>34</td> <td>42</td>		0.32	0.47	ı	4100	1	1.7	0.0065	34	42
0.47 - 6600 - 1.1 0.0065 29 1.0 - 8100 - 0.9 0.0035 38 2.2 - 9100 - 0.6 0.002 43 0.1 - 1500 - 44 0.027 40 0.22 - 1800 - 3.6 0.014 54 0.47 - 2100 - 2.5 0.013 51 0.47 - 3200 - 1.9 0.0055 65 0.1 - 3700 - 1.6 0.0055 65 1.0 - 2300 - 1.6 0.0035 77 1.0 - 2400 - 1.0 0.0035 74 1.0 - 6300 - 1.0 0.0035 74			1.0	ı	4600	,	1.5	0.0035	38	4
1.0 - 8100 - 0.9 0.0035 3.8 2.2 - 9100 - 0.9 0.002 43 0.1 - 1500 - 44 0.017 40 0.47 - 1800 - 3.6 0.014 54 0.47 - 2100 - 3.0 0.005 54 0.47 - 3200 - 1.9 0.0055 65 0.1 - 3700 - 1.6 0.0055 67 1.0 - 3700 - 1.6 0.0055 67 1.0 - 5200 - 1.6 0.0055 77 2.2 - 7700 - 1.0 0.0035 74 2.2 - 7700 - 0.9 0.0035 74			0.47	1	9	1	1,1	0.0065	29	4
2.2 - 9100 - 0.8 0.002 43 0.1 - 1500 - 4.4 0.027 40 0.22 - 1800 - 3.6 0.014 54 0.47 - 2600 - 3.6 0.016 63 0.47 - 2600 - 2.5 0.013 51 0.47 - 3700 - 1.6 0.0055 65 0.47 - 5200 - 1.6 0.0055 77 1.0 6300 - 1.2 0.005 61 2.2 - 7700 - 1.0 0.0035 74 2.2 - 7700 - 0.9 0.0035 74		7.47	1.0	,	8100	t	6.0	0,0035	38	46
0.1 - 1500 - 4.4 0.027 40 0.22 - 1800 - 3.6 0.014 54 0.47 - 2100 - 3.6 0.014 54 0.22 - 2600 - 2.5 0.013 51 0.47 - 3700 - 1.6 0.0055 65 0.47 - 5200 - 1.6 0.0053 77 1.0 6300 - 1.0 0.0053 77 2.2 - 7700 - 0.9 0.0053 77			2.2	1	9100	ı	8.0	0.002	43	44
0.22 - 1800 - 3.6 0.014 54 0.47 - 2100 - 3.0 0.0065 63 0.22 - 2600 - 2.5 0.013 51 0.47 - 3700 - 1.6 0.0055 65 0.47 - 5200 - 1.6 0.0035 77 1.0 6300 - 1.0 0.0635 74 2.2 - 7200 - 1.0 0.0035 87			0.1	,	1500	'	4.4	0.027	5	34
0.47 - 2100 - 3.0 0.0055 63 0.22 - 2600 - 2.5 0.013 51 0.47 - 3200 - 1.9 0.0055 65 0.1 - 3700 - 1.6 0.0035 77 1.0 - 5200 - 1.2 0.005 61 1.0 - 6300 - 1.0 0.0035 74 2.2 - 7200 - 0.9 0.0023 74		=	0.23	ı	1800	,	3.6	0.014	54	80 177
0.22 - 2600 - 2.5 0.013 51 0.47 - 3200 - 1.9 0.0065 65 0.1 - 3700 - 1.6 0.0035 77 0.47 - 5200 - 1.2 0.006 61 1.0 - 6300 - 1.0 0.0035 74 2.2 - 7200 - 0.9 0.0023 74			0.47	1	2100	ı	3.0	0.0065	63	41
0.47 - 3200 - 1.9 0.0065 65 0.1 - 3700 - 1.6 0.0035 77 0.47 - 5200 - 1.2 0.006 61 1.0 - 6300 - 1.0 0.0035 74 2.2 - 7200 - 0.9 0.0025 74			0.22	ı	2600	ı	2.5	0.013	21	42
0.1 - 3700 - 1.6 0.0035 77 0.47 - 5200 - 1.2 0.006 61 1.0 - 6300 - 1.0 0.0035 74 2.2 - 7200 - 0.9 0.002 85		.22	0.47	ľ	3200	ſ	1.9	0.0065	65	4
0.47 - 5200 - 1.2 0.006 61 1.0 - 6300 - 1.0 0.0035 74 2.2 - 7200 - 0.9 0.002 85			0.1	ı	3700	1	9.1	0.0035	11	4 -
1.0			0.47	ı	5200	'	1.2	0.006	19	48
2.2 - 7200 - 0.9 0.002 85	_	147	1.0	t	6300	1	0.	0.0035	7.	200
			2.2	•	7200	,	6.0	0.002	85	51

518 6AT6 6CN7 6SL7GT• 6T8A 12AT6 12SL7GT•

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* Peak volts.

See Circuit Diagram 1

One triode unit.

See page 492 for explanation of column headings

۲. ن *° Ö <u>ở</u> $C_{\mathbf{g}^2}$ У R_{g2} ዾ R Ebb

39 44 55 55 55 39 56 65 528 238 288 20 ES 123 12 24 24 21 25 28 33 24 3 3 3 32 37 32 33 3.3.4 0.020 0.012 0.006 0.010 0.305 0.003 0.005 0.003 0.002 0.020 0.012 0.006 0.010 0.005 0.003 0.005 0.003 0.002 0.010 0.005 0.003 0.020 0.012 0.006 4.5 4.5 4.4 $\frac{3.2}{3.1}$ 1.8 1.7 1.7 4.7. 5.3 3.5 10.8 10.6 10.5 7.5 0.044 0.046 0.047 0.034 0.035 0.036 0.045 0.046 0.048 0.033 0.034 0.035 0.021 0.022 0.023 0.060 0.062 0.064 0.075 0.077 0.080 0.056 0.057 0.058 0.044 1700 3000 **3**60 700 1200 2500 8 80 0.35 0.80 0.35 0.80 0.35 1.9 0.80 6 0.1 0.22 0.47 1.0 0.1 0.47 1.0 2.2 0.22 0.47 1.0 0.47 1.0 0.1 0.22 0.47 0.22 0.47 1.0 0.22 0.47 0.220.47 0.23 7. 5 9.1 8 8 홄 See Circuit Diagram 3

5879

6CG7 • 6FQ7 6J5 6SN7GTB• 8CG7

44 5

22 25

0.013 0.007 0.004

0.80

7000 9100 10500

0.22 0.47 1.00

0.22

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13

14 18 20

0.063 0.031 0.016

1 1 1

1870 2230 2500

I = I - I

0.047 0.1 0.22

0.047

7 4 5

15 20 23

0.034 0.015 0.006

1.3

3370 4100 4800

0.1

0.1

8

V.G.

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 R_{g2}

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Ebb

- Resistance-Coupled Amplifiers

492 for explanation of column headings.

12SN7GTA

15

33 45

0.028 0.015 0.007

8:1:1

1 1 1

2750 3550 4140

1 1 1

0.1 0.22 0.47

5

180

14 15 15

E 4 4

0.066 0.055 0.015

2.9

1500 1860 2160

0.047 0.1 0.22

0.047

See Circuit Diagram 1

15 14

83 23

0.061 0.032 0.015

3.6 3.0 2.5

 \cup

1300 1580 1800

1 1 1

0.047 0.1 0.22

0.047

919

82 82 96

0.031 0.014 0.0065

1.4

1 1 1

2500 3130 3900

1 1 1

0.1 0.22 0.47

0.7

300

16 16

888

0.015 0.0065 0.0035

0.95 0.69 0.58

 $1 \cdot 1 \cdot 1$

4800 6500 7800

1 1 1

0.22 0.47 1.00

0.22

929

36 45 51

0.016 0.007 0.004

1.0 0.71 0.61

\$150 7000 7800

0.22 0.47 1.00

0.22

L			1	1800	-	2.9	0.060	6	2
	0.047		ı	2100	1	2.4	0.033	12	Ξ
		0.22	1	2200	ı	2.3	910.0	14	17

21 29 35 0.027 0.015 0.007 0.015 0.006 0.003 0.063 0.033 0.016 53 64 **5** 5 0 1 1 1 3200 3900 4300 111 90 0.1 0.22

			!				?
As Triode:			0.47	1	4300	ı	0.
		_	0.22	'	6200	1	0.87
5870		0.23	0.47	ı	8100	ı	0.53
;			1.00		0006	1	0.49
			0.047	,	1200	•	3.5
į		0.047		1	1500	r	2.6
See Circuit			0.22	1	1800	1	2.4
Diagram 1			1.0	1	2200	1	6.1
	180	٥.٢	0.22	i	2900	1	1.35
			0.47	ı	3400	1	1.1
			0.22	'	4500	-	0.92
		0.22	0.47	t	6400	1	0.61
			1.00	t	8200	ı	0.52
			0.047	_	1100	ı	3.9
		0.047		ı	1500	,	2.8
			0.22	1	1700	ı	2.5
			0.1	1	0002	ı	2.1
	8	 	0.22	ı	3460	ı	4.
			0.47	ı	3700	ı	1.1
			0.32	ı	4300	1	0.97

* Peak voits.

0

433

0.023 0.013 0.007

4 4 6

4400 4700 4800

. . .

0.1 0.22 0.47

52 48

0.006 0.003 0.002

0.9

12000 13000 14000

1 1 1

1.0

0.47

433

13 12

8 4 8

0.012 0.006 0.003

7400 7400 7600

0.22 0.47 1.0

0.22

8

13 13

12AY6 12AX7• 12AX7A 20EZ7* 3AV6 6AV6 6EU7•

545

18 25 32

0.025

3.5

1800 2000 2200

0.1 0.22 0.47

See Circuit Diagram 1

522

57.29

0.027 0.013 0.006

4.4.6 0.6.0

1300 1500 1700

0.1 0.22 0.47

59

282

0.013 0.006 0.003

23.0

2200 2800 3100

1.1.1

0.47

0.23

8

135

\$ X 23 3

0.032 0.015 0.007 0.025

55

88 4

0.003

0.63

1.1

7200

1.00

0.22

8 22 25

92 44

0.006

1.6

1 1 1

4300 5200 5900

1 1 1

2.2

0.47

7025

888 888

888

0.006 0.003 0.002

1.0

5800 6700 7400

0.47 1.0 2.2

0.47

4 4 4 5 5 5 4

45 71 72

0.063 0.033 0.016

28 39 47

0.015 0.006 0.003

3 4 2

0.012 0.006 0.003

2.4

3000 3500 3900

0.22 0.47 1.0

0.22

380

5 7 7

3 8 5

0.031 0.015 0.007

* Peak volts. • One triode unit.

- RCA Receiving Tube Manual

(See page 492 for explanation of column headings)

1			T -		_	-		_																		
Ľ	2	70	2	20	20	2	30	20	23	24	25	23	24	74	22	23	23	26	27	27	25	30	25	24	74	24
6	13	16	12	17	20	16	21	22	25	32	35	30	32	38	35	4	49	38	\$	57	42	20	4	So	2	46
0.058	0.032	0.015	0.029	0.015	0.0075	0.0135	0.0075	0.0036	0.062	0.032	0.0155	0.030	0.0152	0.0073	0.0150	0.0072	0.0038	0.062	0.032	0.016	0.031	0.015	0.0074	0.015	0.0073	0.0039
0.4	3.5	3.0	2.1	1.7	1.4	0.98	0.78	0.63	6.0	4,4	4.0	2.80	2.30	2.00	1.24	96.0	0.79	6.70	5.50	4.30	3.5	2.5	2.1	1.5	1.1	0.88
i	1	1	1	ı	1	1	ı	ı	1	1	ı	1	ı	!	ı	ı	J	,	1	,		,	ı	'	1	1
1580	1760	1820	2920	3570	4020	6040	7500	8800	694	817	905	1596	1630	1860	3950	4500	5530	438	542	644	1009	1332	1609	2623	3900	4920
ı	1	ı	ı	ı	1	ı	ı	_		ı	ı	1	ı	-	ı	1	1	1	r	,	1	ı	ı		,	,
0.047	0.10	0.22	0.1	0.22	0.47	0.22	0.47	1.0	0.047	 	0.22	0.1	0.22	0.47	0.22	0.47	9.7	0.047	0.	0.22	0.10	0.22	0.47	0.22	0.47	0.1
	0.047	ĺ		0.1			0.22			0.047			0.10			0.22			0.047			0.10			0.22	
				8	;						1	-	88		_		7					300		L		
	0.047 - 1580 - 4.0 0.058	- 1580 - 4.0 0.058 - 1760 - 3.5 0.032	0.047 - 1580 - 4.0 0.10 - 1760 - 3.5 0.22 - 1820 - 3.0	0.047 0.047 - 1580 - 4.0 0.058 0.047 0.10 - 1760 - 3.5 0.032 0.22 - 1820 - 3.0 0.015 0.1 - 2920 - 2.1 0.029	0.047 - 1580 - 4.0 0.058 0.10 - 1760 - 3.5 0.032 0.22 - 1820 - 3.0 0.015 0.1 - 2920 - 2.1 0.029 0.22 - 3570 - 1.7 0.015	0.047 - 1580 - 4.0 0.058 0.02 - 1760 - 3.5 0.032 0.1 - 1820 - 3.0 0.015 0.1 - 2920 - 2.1 0.029 0.47 - 4020 - 1.7 0.015 0.47 - 4020 - 1.4 0.0075	0.047 0.047 - 1580 - 4.0 0.058 0.22 - 1820 - 3.5 0.032 0.12 - 2920 - 2.1 0.029 0.1 0.2 - 370 - 1.7 0.029 0.2 - 4020 - 1.4 0.0075 0.22 - 6040 - 0.98 0.0135	0.047 - 1580 - 4.0 0.058 0.047 0.10 - 1760 - 3.5 0.032 0.12 - 1820 - 3.0 0.015 0.1 0.22 - 2.1 0.029 0.47 - 3570 - 1.7 0.015 0.22 0.47 - 6040 - 1.4 0.0075 0.22 0.47 - 7500 - 0.78 0.0135	0.047 - 1580 - 4.0 0.058 0.10 - 1760 - 3.5 0.032 0.1 0.12 - 2220 - 2.1 0.029 0.1 0.42 - 3570 - 1.7 0.015 0.22 - 40.0 - 1.7 0.075 0.22 - 6040 - 0.78 0.0075 1.0 - 7500 - 0.78 0.0035 1.0 - 8800 - 0.63 0.0036	0.047 - 1580 - 4.0 0.058 0.10 - 1760 - 3.5 0.032 0.1 - 1820 - 3.5 0.032 0.1 - 2220 - 1.7 0.029 0.47 - 3570 - 1.7 0.015 0.22 - 6040 - 0.78 0.015 0.22 - 6040 - 0.78 0.0075 1.0 - 8800 - 0.63 0.0036 0.047 - 694 - 6.0 0.062	0.047 0.047 - 1580 - 4.0 0.058 0.22 - 1820 - 3.5 0.032 0.1 0.1 - 2920 - 2.1 0.029 0.47 - 4020 - 0.08 0.22 0.27 - 4020 - 0.08 0.22 0.47 - 6040 - 0.08 0.047 - 6890 - 0.03 0.047 - 694 - 6.0 0.032	0.047 - 1580 - 4.0 0.058 0.10 - 1760 - 3.5 0.032 0.1 - 1820 - 3.5 0.032 0.1 - 2920 - 1.7 0.015 0.47 - 3370 - 1.7 0.029 0.22 0.47 - 4020 - 1.4 0.0075 1.0 - 8800 - 0.53 0.0075 0.047 - 8800 - 0.63 0.0036 0.047 - 8800 - 0.63 0.0036 0.047 - 8800 - 0.63 0.0036 0.047 - 817 - 4.4 0.032 0.22 - 905 - 4.0 0.0155	0.047 0.047 - 1580 - 4.0 0.058 0.22 - 1820 - 3.5 0.032 0.1 0.22 - 3570 - 1.7 0.015 0.47 - 4020 - 1.4 0.0075 0.22 0.47 - 6040 - 0.58 0.0035 0.047 0.047 - 694 - 6.0 0.03 0.047 0.1 - 817 - 6.0 0.047 0.1 - 817 - 4.4 0.032 0.15 - 1596 - 2.80 0.035	0.047 - 1580 - 4.0 0.058 0.10 - 1760 - 3.5 0.032 0.1 0.22 - 1820 - 3.5 0.032 0.1 0.21 - 2920 - 2.1 0.029 0.47 - 4020 - 1.4 0.0075 0.22 0.47 - 7500 - 0.78 0.0075 1.0 - 7500 - 0.78 0.0075 0.047 - 7500 - 0.78 0.0075 0.047 - 694 - 6.0 0.062 0.047 - 817 - 4.4 0.035 0.10 0.12 - 1550 - 4.4 0.0155 0.10 0.22 - 1630 - 2.80 0.035	0.047 0.047 - 1580 - 4.0 0.058 0.027 - 1820 - 3.5 0.032 0.1 0.1 - 1920 - 1.1 0.029 0.2 0.47 - 4020 - 1.4 0.0075 0.22 0.47 - 7500 - 1.4 0.0075 0.047 - 8800 - 0.78 0.0075 0.047 - 817 - 6.4 0.03 0.047 - 1800 - 0.03 0.047 - 1800 - 0.03 0.047 - 1800 - 0.03 0.047 - 1800 - 0.03 0.047 - 1800 - 0.03 0.047 - 1800 - 2.80 0.030	0.047 0.047 - 1580 - 4.0 0.058 0.22 - 1820 - 3.5 0.032 0.1 0.1 - 1580 - 3.0 0.015 0.1 0.2 - 2920 - 1, 0.029 0.47 - 4020 - 1, 4 0.0075 0.22 0.47 - 7500 - 0.78 0.0075 1.0 - 8800 - 0.78 0.0075 0.047 - 694 - 6.0 0.062 0.047 - 1596 - 0.63 0.032 0.047 - 1596 - 4, 0.032 0.10 0.1 - 1596 - 4,0 0.0155 0.10 0.2 - 1850 - 2.80 0.030 0.10 0.2 - 1850 - 2.30 0.0152 0.20 0.075	0.047 0.047 - 1580 - 4.0 0.058 0.032 0.022 - 1820 - 3.5 0.032 0.035 0.02 0.15 0.047 0.10 - 1820 - 3.5 0.032 0.035 0.1 0.1 0.2 0.47 - 4020 - 1.7 0.0055 0.2 0.47 - 5000 - 0.78 0.0075 0.047 0.1 0.0073 0.1 0.047 0.1 0.047 0.1 0.0 0.0073 0.1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.047 0.047 - 1580 - 4.0 0.058 0.22 - 1820 - 3.5 0.032 0.1 0.22 - 1820 - 17.0 0.058 0.47 - 3570 - 17.7 0.015 0.47 - 4020 - 17.7 0.015 0.047 - 6040 - 0.8 0.0075 0.047 - 6040 - 0.63 0.0036 0.047 - 1500 - 0.7 0.063 0.047 - 1500 - 0.063 0.047 - 1500 - 0.063 0.047 - 1500 - 0.063 0.047 - 1500 - 0.063 0.047 - 1860 - 2.80 0.030 0.10 0.12 - 1860 - 2.80 0.0073 0.47 - 1860 - 2.00 0.0073 0.47 - 1860 - 0.0073 0.47 - 1860 - 0.0073 0.47 - 1860 - 0.0073 0.0073	0.047	0.047 - 1580 - 4.0 0.058 0.10 - 1760 - 3.5 0.032 0.1 0.21 - 1820 - 3.5 0.032 0.1 0.21 - 2920 - 1.1 0.029 0.22 0.47 - 4020 - 1.7 0.015 0.22 0.47 - 7500 - 1.7 0.015 1.0 - 7500 - 0.78 0.0075 1.0 - 7500 - 0.78 0.0075 0.047 - 7500 - 0.78 0.0075 0.047 - 694 - 6.0 0.062 0.1 - 1596 - 4.0 0.015 0.1 0.22 - 1630 - 2.0 0.0073 0.22 - 1860 - 2.0 0.0073 0.22 -<	0.047 0.047 - 1580 - 40 0.058 0.027 - 1820 - 3.5 0.032 0.1 0.12 - 1820 - 3.0 0.015 0.1 0.22 - 3370 - 1.4 0.0075 0.22 0.47 - 4020 - 1.4 0.0075 1.0 - 8800 - 0.78 0.0075 0.047 0.1 - 8800 - 0.63 0.0056 0.047 - 694 - 6.0 0.062 0.10 0.22 - 1650 - 2.80 0.035 0.10 0.22 - 1650 - 2.80 0.0155 0.10 0.22 - 1650 - 2.80 0.0155 0.11 - 1850 - 2.00 0.0155 0.12 0.22 - 1650 - 2.00 0.0155 0.22 0.47 - 1860 - 2.00 0.0155 0.47 - 4480 - 1.24 0.0150 0.047 - 4480 - 0.079 0.0082 0.047 - 4480 - 0.079 0.0082 0.047 - 4480 - 0.79 0.0082 0.047 - 4480 - 0.79 0.0082	0.047 0.047 - 1580 - 40 0.058 0.027 - 1820 - 3.5 0.032 0.1 0.1 - 1920 - 1.7 0.015 0.2 0.47 - 2920 - 1.7 0.015 0.22 0.47 - 4020 - 1.4 0.015 1.0 - 8800 - 0.78 0.015 0.047 - 8800 - 0.78 0.005 0.047 - 880 - 0.05 0.047 - 180 - 0.05 0.047 - 180 - 0.05 0.047 - 180 - 0.05 0.01 0.22 - 180 0 0.032 0.02 - 180 0 0.032 0.03 0.035 0.047 - 1860 - 2.00 0.0152 0.047 - 438 - 0.079 0.0052 0.047 - 438 - 0.79 0.032 0.047 - 438 - 0.79 0.032 0.047 - 438 - 0.79 0.032 0.047 - 5530 - 1.24 0.0150 0.047 - 5530 - 0.79 0.032	0.047 0.047 - 1580 - 4.0 0.058 0.22 - 1760 - 3.5 0.032 0.1 0.22 - 1820 - 1.1 0.029 0.47 - 4020 - 1.7 0.015 0.47 - 4020 - 1.7 0.015 0.047 - 8800 - 0.78 0.0075 0.047 - 8800 - 0.78 0.0075 0.047 - 1890 - 0.78 0.0075 0.047 - 1890 - 0.78 0.0036 0.047 - 1890 - 0.78 0.0036 0.047 - 1890 - 0.053 0.0036 0.047 - 1890 - 2.80 0.030 0.10 0.22 - 1890 - 2.80 0.030 0.47 - 4500 - 2.00 0.0152 0.47 - 4500 - 0.96 0.0072 1.0 - 5530 - 1.24 0.0150 0.047 - 4500 - 0.96 0.0072 0.047 - 438 - 6.70 0.062 0.047 - 438 - 6.70 0.062 0.047 - 438 - 6.70 0.062 0.0072 - 644 - 4.30 0.016	0.047 0.047 - 1580 - 40 0.058 0.032 0.022 - 1820 - 3.5 0.032 0.035 0.02 0.02 - 3.5 0.035 0.035 0.02 0.02 0.047 - 3590 - 17, 0.015 0.047 - 4020 - 1.7 0.0075 0.47 - 4020 - 1.7 0.0075 0.047 0.047 - 8800 - 0.78 0.0075 0.0047 0.1 - 8800 - 0.78 0.0035 0.0047 0.1 - 8800 - 0.053 0.0036 0.02 0.02 0.1 - 1590 0.035 0.035 0.02 0.1 - 1590 0.035 0.037 0.057 0.057 0.057 0.057 0.0074 0.1 0.1 0.0074 0.1 0.1 0.0074 0.1 0.1 0.0074 0.1 0.1 0.0074 0.1 0.1 0.0074 0.1 0.1 0.0074 0.1 0.1 0.0074 0.1 0.1 0.0074 0.1 0.1 0.0074 0.1 0.1 0.0074 0.1 0.1 0.0074 0.1 0.1 0.1 0.0074 0.1 0.1 0.0074 0.1 0.1 0.1 0.0074 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.047 0.047 - 1580 - 4.0 0.058 0.032 0.022 - 1820 - 3.5 0.032 0.035 0.022 - 1820 - 1.7 0.015 0.015 0.02 0.047 - 357 0.025 0.047 - 357 0.015 0.047 - 4020 - 1.7 0.015 0.047 0.047 - 6040 - 0.63 0.0075 0.022 0.47 - 8800 - 0.78 0.0075 0.022 0.047 - 8800 - 0.63 0.0036 0.022 0.047 - 1850 0 - 0.63 0.0036 0.022 0.047 - 1850 0 - 2.80 0.030 0.0152 0.47 - 1860 - 2.80 0.030 0.0152 0.47 - 4500 0 0.0152 0.047 0.1 1860 - 2.00 0.0073 0.0072 0.47 - 4500 - 0.06 0.0072 0.047 0.1 5520 0.035 0.0036 0.0047 0.1 5520 0.035 0.0036 0.0047 0.1 5520 0.005 0.005 0.006 0.0072 0.006 0.0072 0.00	0.047 - 1580 - 4.0 0.058 0.02 - 1760 - 3.5 0.032 0.1 0.12 - 1920 - 1.1 0.005 0.1 0.22 - 2920 - 1.7 0.015 0.22 0.24 - 4020 - 1.7 0.015 0.047 - 7500 - 0.78 0.015 0.047 - 7500 - 0.78 0.005 0.047 - 7500 - 0.78 0.005 0.047 - 6040 - 0.63 0.005 0.047 - 6040 - 0.63 0.005 0.10 0.12 - 1800 - 4.4 0.035 0.10 0.22 - 1630 - 2.00 0.0073 0.22 - 1850 - 2.00 0.0073 0.24

5BK7A* 5BQ7A* 6BK7B* 6BQ7A* 6BZ7*

See Circuit Diagram 1

4BQ7A* 4BZ7*

9

2 0.480 3800 0.046 1.0 0.47 0.480 3800 0.049 1.0 0.500 4400 0.049 1.0 0.500 4400 0.033 1.0 1.04 7700 0.033 2.2 1.10 4700 0.033 2.2 1.10 4800 0.018 2.2 1.50 1800 0.016 2.2 1.50 1800 0.062 1.0 0.650 1900 0.062 1.0 0.650 1900 0.062 1.0 0.650 1900 0.059 2.2 1.00 3800 0.039 2.2 1.00 3800 0.039 2.2 1.00 3800 0.039 2.2 1.00 3800 0.039 2.2 1.00 3800 0.039 2.2 1.00 3800 0.039 2.2 1.00 3800 0.039										
0.22 0.480 3800 0.046 1.0 1.047 0.480 3800 0.049 1.0 0.507 1.04 7200 0.049 1.0 1.04 7700 0.033 1.0 2.2 1.10 8400 0.018 1.0 2.2 1.50 18600 0.018 0.22 0.47 1.04 7700 0.031 0.22 0.47 1.00 3400 0.052 0.47 1.0 1.00 3400 0.052 0.47 1.0 1.00 3400 0.059 1.0 2.2 1.60 3800 0.059 0.47 1.0 1.00 3800 0.089 1.0 2.2 1.60 7800 0.089 1.0 1.0 0.40 1.35 2000 0.064 0.47 1.25 2000 0.064 1.0 0.47 1.25 2000 0.064 1.0 0.47 1.35 2000 0.064 1.0 0.47 1.35 2000 0.064 1.0 0.47 1.35 2000 0.064 1.0 0.47 1.35 2000 0.054 1.0 0.47 1.35 2000 0.054 1.0 0.47 1.35 2000 0.054 1.0 0.47 1.35 2000 0.054 1.0 0.47 1.35 2000 0.054 1.0 0.47 1.35 2000 0.054 1.0 0.47 1.35 2000 0.054 1.0 0.47 1.35 2000 0.054 1.0 0.47 1.35 2000 0.054 1.0 0.47 1.35 2000 0.054					<u> </u>	-				
0.22 0.47 0.480 3800 0.049 1.0 0.500 4400 0.045 0.47 1.04 7700 0.033 0.47 1.0 1.04 7700 0.033 1.0 2.2 1.10 8400 0.031 1.0 2.2 2.50 1600 0.018 0.22 0.47 0.650 1800 0.062 0.47 1.0 1.00 3400 0.062 0.47 1.0 1.00 3800 0.059 1.0 2.2 2.60 7300 0.059 0.47 1.0 1.00 3800 0.059 0.47 0.680 1090 0.084 1.0 2.2 2.60 7300 0.084 1.0 2.2 2.60 7300 0.084 0.47 1.25 2.00 0.064 0.47 1.2 2.00 0.084 1.0 0.20 0.47 0.680 1090 0.084 1.0 0.47 1.25 2000 0.064 0.47 1.0 1.00 3800 0.084 1.0 0.47 0.680 1090 0.084 1.0 0.47 0.680 1090 0.084 1.0 0.47 0.680 1090 0.084 1.0 0.47 0.680 0.061			0.22	0.480		0.046	5.5	0.0084	10	8
1.0 0.500 4400 0.045 0.47 1.04 7200 0.033 0.47 1.04 7200 0.033 1.0 2.2 1.10 8400 0.031 1.0 2.2 2.50 16000 0.016 0.22 0.47 0.620 1800 0.052 0.47 1.0 3400 0.052 0.47 1.0 3400 0.053 0.47 1.0 3800 0.059 0.47 1.0 3800 0.059 0.47 1.0 3800 0.059 0.47 1.0 3800 0.059 0.47 1.0 3800 0.059 0.47 1.0 3800 0.059 0.47 1.15 2.00 0.064 0.47 1.2 2.6 0.084 0.47 1.3 2.00 0.064 0.47 1.3 2.00 0.064 0.47 1.3 2.50 0.051 0.47 1.3 2.50 0.051 0.47 1.3 2.50 0.051 0.47 1.3 2.50 0.051 0.47 1.5 2.50 0.051 0.47 1.5 2.50 0.051 0.47 1.5 2.50 0.051 0.47 0.58 0.051 0.47 0.58 0.051 0.47 0.58 0.051 0.52 3.0 4.00 0.63 0.053 0.63 0.053 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.63 0.64 0.65 0.65 0.65 0.65		0.22	0.47	0.480		0.049	5.5	0.0054	16	114
0.47 1.04 7200 0.033 1.0 1.0 1.04 7700 0.033 1.0 2.2 1.10 8400 0.031 1.0 2.2 1.50 18600 0.016 0.22 0.47 0.650 1800 0.062 1.0 0.47 1.00 3400 0.059 0.47 1.0 1.00 3500 0.059 1.0 2.2 2.60 7400 0.059 0.47 1.00 3800 0.059 0.47 1.00 3800 0.059 0.47 1.00 3800 0.059 0.47 1.00 3800 0.059 0.47 1.00 3800 0.059 0.47 1.13 2.60 0.084 11 0.47 1.25 2000 0.064 2 0.47 1.25 2000 0.064 2 0.47 1.25 2000 0.064 2 0.47 1.25 2000 0.054 11 0.47 1.25 2000 0.054 2 0.47 1.25 2000 0.054 2			1.0	0.500		0.045	5.3	0.0034	23	128
0.47 1.0 1.04 7700 0.033 2.2 1.10 8400 0.031 1.0 2.2 1.50 18600 0.018 0.22 0.47 1.650 1800 0.062 0.47 1.0 3400 0.062 0.47 1.0 3400 0.059 0.47 1.0 3800 0.059 1.0 2.6 7300 0.029 0.22 0.47 1.00 3800 0.059 0.47 1.0 3800 0.089 1.0 2.2 2.60 7300 0.029 0.22 0.47 0.680 1090 0.084 1.0 0.47 1.25 2000 0.064 0.47 1.25 2000 0.064 0.47 1.25 2000 0.064 0.47 1.25 2000 0.064			0.47	1.04	7200	0.033	2.9	0.0044	2	Ξ
1.0 2.2 1.10 8400 0.031 1.0 2.50 16000 0.018 1.0 2.2 2.50 18600 0.016 0.22 0.47 0.650 1800 0.062 0.47 1.0 1.00 3400 0.059 1.0 2.2 1.00 3400 0.059 1.0 2.2 2.60 7300 0.029 0.22 0.47 0.680 1090 0.084 1.0 2.2 2.60 980 0.088 0.47 1.0 1.0 0.009 0.22 0.47 0.680 1090 0.084 1.0 0.22 0.47 0.680 1090 0.084 1.0 0.47 1.25 2000 0.064 0.47 1.2 2.000 0.064 0.47 1.2 2.000 0.064 0.47 1.2 2.000 0.064 0.47 1.2 2.000 0.064 0.47 1.2 2.000 0.064	6	0.47	0.1	1.04	7700	0.033	7.8	0.0029	15	33
1.0 2.50 16000 0.018 0.22 0.47 18600 0.0072 0.47 0.650 1800 0.062 1.0 0.47 1.00 3400 0.062 0.47 1.0 1.00 3400 0.059 1.0 2.2 1.00 3800 0.059 1.0 2.2 2.60 7400 0.029 0.22 0.47 0.680 1090 0.084 11 0.47 1.0 1.05 0.084 11 0.47 1.0 1.25 0.000 0.064 0.47 1.2 2.00 0.064 1.0 0.70 1.35 2000 0.064 2.2 1.53 2350 0.057			2.2	1.10	8400	0.031	5.6	0.0020	18	152
0.22 0.50 18600 0.016 0.22 0.47 0.650 1800 0.062 0.47 0.650 1800 0.062 0.47 1.0 0.650 1900 0.062 0.47 1.0 1.00 3400 0.059 1.0 2.2 1.00 3800 0.059 1.0 2.2 2.60 7400 0.029 0.22 0.47 0.680 1090 0.084 11 0.22 0.47 0.680 1090 0.084 11 0.47 1.2 2.60 0.064 0.081 11 0.47 1.2 2.60 0.064 0.081 11 0.47 1.2 2.60 0.064 0.081 11 0.47 1.2 2.60 0.064 0.081 11 0.47 1.2 2.60 0.064 0.064 0.067 0.081 11 0.47 1.2 2.60 0.064 0			1.0	2.50	16000	0.018	1.4	0.0023	92	118
0.22 0.25 0.550 1600 0.072 0.650 1800 0.062 0.062 0.650 1800 0.062 0.062 0.650		0.0	2.2	2.50	18600	0.016	1.2	0.0017	=	139
0.22 0.47 0.620 1800 0.062 0.062 0.062 0.045 0.045 0.062 0.062 0.065 0.0			0.22	0.550		0.072	9.5	0.0090	30	161
1.0 0.650 1900 0.062 0.47 1.00 3400 0.059 2.2 1.00 3800 0.059 1.0 2.2 2.60 7400 0.029 0.22 0.47 0.680 1090 0.029 0.22 0.47 0.680 1090 0.084 1 0.47 1.25 2000 0.064 0.47 1.25 2000 0.064 1.0 0.47 1.25 2000 0.064 1.0 1.0 1.34 2150 0.061 1.0 2.2 3.50 4700 0.064		0.22	0.47	0.620		0.062	8.5	0.0053	36	208
0.47 1.00 3400 0.059 2.2 1.00 3800 0.059 2.2 1.00 3800 0.059 1.0 2.60 7400 0.029 0.22 0.600 980 0.0885 1 0.22 0.47 0.680 1090 0.084 1 0.47 1.25 2000 0.064 0.47 1.25 2000 0.064 1.0 1.0 1.34 2150 0.061 1.0 2.2 3.00 4.000			-	0.650		0.062	5.5	0.0034	43	239
0.47 1.0 1.00 3500 0.059 1.0 2.2 1.00 3800 0.059 1.0 2.60 7400 0.029 0.22 0.600 980 0.085 1 0.02 0.47 0.680 1090 0.084 1 0.47 1.25 2000 0.064 0.47 1.25 2000 0.064 1.0 1.0 1.53 2350 0.051			0.47	1.00	3400	0.059	6.0	0.0048	34	183
1.0 2.2 1.00 3800 0.059 1.0 2.2 2.60 7300 0.029 1.0 2.2 2.60 7400 0.029 0.22 0.47 0.680 1090 0.084 11 0.47 1.25 2000 0.064 0.47 1.0 1.34 2150 0.061 1.0 2.2 1.53 2350 0.057	180	0.47	1,0	1.00	3500	0.029	0-9	0.0031	4	229
1.0 2.2 2.60 7300 0.029 0.22 0.600 980 0.085 1 0.22 0.47 0.680 1090 0.084 1 1.0 0.700 1150 0.081 1 0.47 1.25 2000 0.064 1 2.2 1.53 2350 0.057 1 1.0 2.60 4000 0.057 1 1.0 2.2 3.00 0.034			2.2	1.00	3800	0.059	5.8	0.0020	46	262
1.0 2.2 2.60 7400 0.029 0.22 0.600 980 0.085 1 0.22 0.47 0.680 1090 0.084 1 1.0 0.700 1150 0.081 1 0.47 1.25 2000 0.064 0.47 1.25 2000 0.064 2.2 1.53 2350 0.057 1.0 2.60 4000 0.044			1.0	2.60	7300	0.029	2.7	0.0022	33	227
0.22 0.22 0.600 980 0.085 1.0 0.700 1150 0.084 0.47 1.25 2000 0.064 0.47 1.25 2000 0.064 2.2 1.53 2350 0.057 1.0 2.60 4000 0.044 2.2 3.00 4.004		1.0	2.2	2.60	7400	0.029	2.7	0.0016	38	281
0.22 0.47 0.680 1090 0.084 1.0 0.700 1150 0.081 0.47 1.25 2000 0.064 1.3 2150 0.057 1.0 2.2 1.53 2350 0.057 1.0 2.60 4.000 0.044			0.22	0.600		0.085	13.0	0.0085	51	223
1.0 0.700 1150 0.081 1 0.47 1.25 2000 0.064 2.2 1.53 2350 0.057 1.0 2.2 3.00 0.044		0.22	0.47	0.680		0.084	12.0	0.0055	64	288
0.47 1.25 2000 0.064 1.0 1.34 2150 0.061 2.2 1.53 2350 0.057 1.0 2.6 4000 0.044			1.0	0 700	1150	0.081	11.0	0.0033	74	334
0.47 1.0 1.34 2150 0.061 2.2 1.53 2350 0.057 1.0 2.60 4600 0.044			0.47	1.25	2000	0.064	7.9	0.0045	52	285
1.0 2.60 4000 0.044 2.2 3.00 4700 0.044	300	0.47	0.	1.34	2150	0.061	9.2	0.0029	67	363
2.2 3.00 4000 0.044			2.2	1.53	2350	0.057	7.1	0.0019	79	416
2.2 3.00 4200 0.039			1.0	2.60	4000	0.044	5.2	0.0023	51	334
9000 0000 0000		1.0	2.2	3.00	4700	0.038	4,3	0.0015	8	427

3BC5 3CB6 3CF6 4BC5 4CB6 6AG5 6BC5 6CB6 6CB6

* Peak volts. One triode unit.

See Circuit Diagram 3

Resistance-Coupled Amplifiers

See page 492 for explanation of column headings)

7199 (Z)

95 113 131

16 22 25

0.0046 0.0030 0.0020

2.70 3.00 2.80

0.036 0.044 0.043

6000 6700 6700

0.870 0.980 1.00

0.47 1.0 2.2

0.47

8

23 95 109

17

0.0090 0.0055 0.0033

4.50 4.30 4.00

0.046 0.043 0.039

3700 3900 4200

0.560 0.600 0.640

0.22 0.47 1.0

0.22

Eo* V.G.

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 R_{g2}

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Ebb

119

15

0.0028 0.0016

1.44

0.021

12200 12800

2.20

1.0

1.0

Pentode Unit

82 164 190

32 38 45

0.0088 0.0064 0.0034

7.50 7.40 7.30

0.069 0.064 0.061

1570 1730 1820

0.530 0.600 0.650

0.22 0.47 1.0

0.22

147 209 250

8 4 4

0.0046 0.0028 0.0019

5.30 5.10 5.40

0.053 0.042 0.040

3200 3500 3740

1.12 1.40 1.57

0.47 1.0 2.2

0.47

180

179

39

0.0024

2.80

0.039

6500

3.40

2.2

0.1

See Circuit Diagram 3

182 236 257

52 66 77

0.0085 0.0052 0.0033

11.2 10.5 10.0

0.086 0.076 0.076

9200 1010 1100

0.600 0.670 0.720

0.22 0.47 1.0

0.22

221 296 345

41 72 82

0.0044 0.0027 0.0019

7.0 6.4 6.3

0.060 0.053 0.055

1950 3210 2200

1,25 1,43 1,45

0.47 1.0 2.2

0.47

300

295 378

57 74

0.0022

3.6

0.040 0.037

4340

3.00

1.0

1.0

<u>1</u>3

5 5 4

6 2 4

0.029 0.015 0.008

1.24

1 1 1

2630 3090 3440

0.1 0.22 0.47

0.10

8

13 13

8 C I

0.060 0.032 0.016

2.8 2.8 4.4

1 1 1

1292 1401 1470

1 1 8

0.047 0.1 0.22

0.047

7199

12 12 12 12

12 18 18

0.015 0.0077 0.0045

0.70 0.51 0.44

I = I

6550 8270 9130

1 1 1

0.22 0.47 1.0

0.22

Triode Unit

2 2 2

0.061 0.032 0.016

3.5 2.9

1 1 1

723 836 948

1 1 1

0.047 0.1 0.22

0.047

14 13

3 2 4 2

0.031 0.016 0.0082

2.0 1.6

1 1 1

1543 2002 2522

0.1 0.22 0.47

0.10

180

122

4334

0.015 0.0078 0.0046

0.79

4390 6122 8060

0.22 0.47 1.0

0.22

15 15

238 44 44

0.061 0.031 0.015

3.6

1 1 1

534 726 840

0.047 0.1 0.22

0.047

See Circuit Diagram 1

36 51

0.015 0.0079 0.0045

0.93 0.69 0.56

1 1 1

3133 4480 4930

1 1 1

0.22

0.22

24 52

0.031 0.0155 0.0078

2.3 1.7 1.31

11117 1613 2043

0.1 0.22 0.47

0.10

300

* Peak volts.

Z 1-5/16 1-9/32 1-9/32 1-9/32

Y 2-3/4 3-5/16 3-1/2

X 3-5/16 3-9/16 3-7/8 4-1/16

 $egin{array}{c} Z \\ 1-9/32 \\ 1-9/32 \\ 1-5/16 \\ 1-9/32 \\ 1-9/32 \\ 1-9/32 \\ 1-9/32 \\ \end{array}$

2-5/16 2-7/16 2-3/4 2-13/16 2-7/8 3-1/4

¥× ¥X.

6

Ę,

- 13 MAX. SMALL

MAX.

<u>™</u>9

/ [] [J] []
- SMALL-BUTTON
- DUODECAR 12-PIN

LARGE-BUTTON NEONOVAL 9-PIN

6

<u>-2</u>

<u>|</u>

 $\begin{array}{c} z \\ 1.770 - 2.010 \\ 2.070 - 2.310 \\ 2.370 - 2.610 \end{array}$

2.320 2.620 2.920

IIBB MAX. *

- I.IBB MAX.

= Outlines =

OCTAL

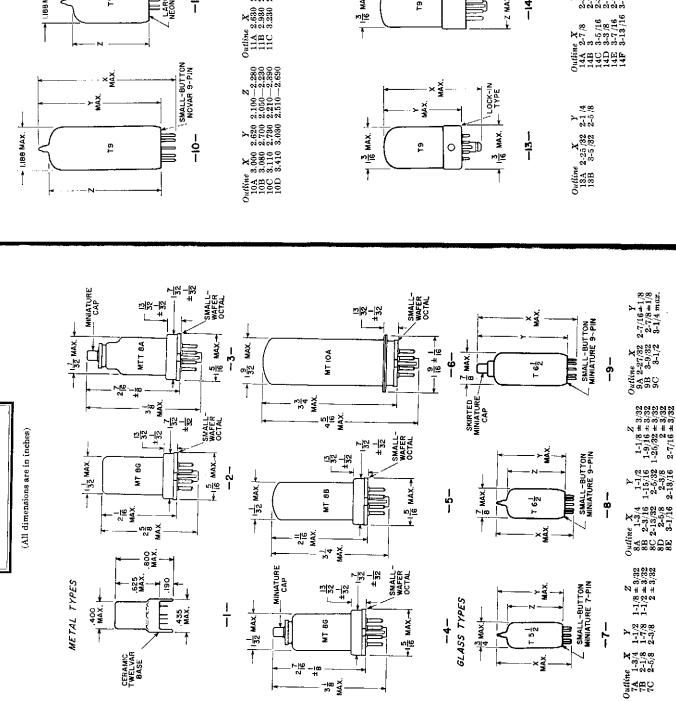
\OCTAL

← Z MAX:→

15

141 -Z MAX

Outlines



501

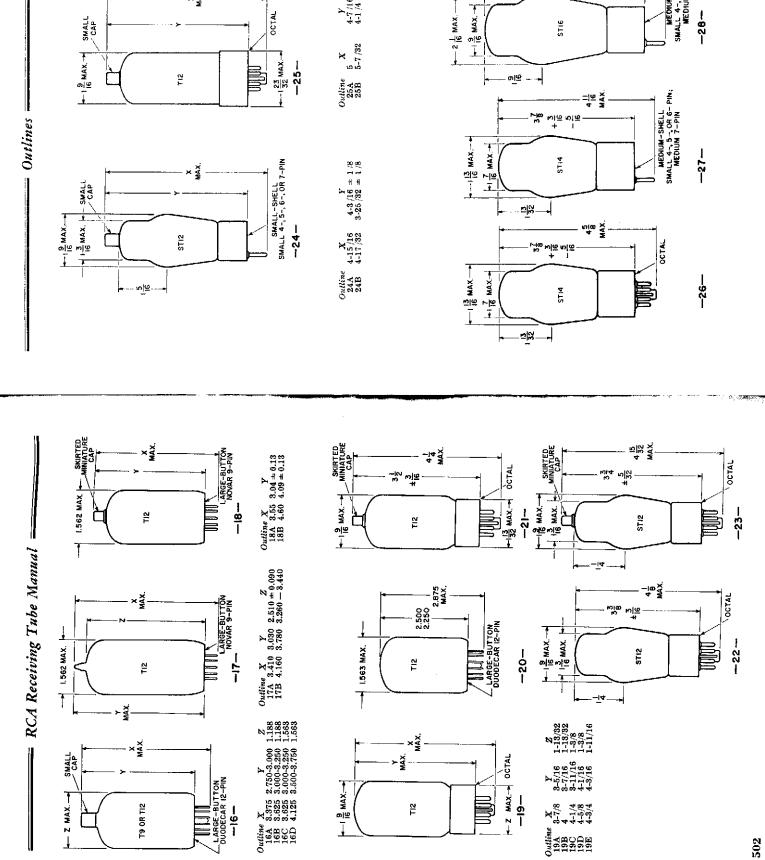
MECNUM-SHELL SMALL, 4-,5-, OR 6-PIN; MEDIUM 7-PIN

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Y 4-7 /16 4-1 /4

OCTAL

SMALL

The circuits included in this Manual illustrate some of the more important applications of RCA receiving tubes; they are not necessarily examples of commercial practice. These circuits have been conservatively designed and are capable of excellent performance. Electrical specifications are given for circuit components to assist those interested in home construction. Layouts and mechanical details are omitted because they vary widely with the requirements of individual set builders and with the sizes and shapes of the components employed.

Circuits designed for operation from both ac and de voltage supplies should be installed in non-metallic cabinets or properly insulated from metallic cabinets. Potentiometer shafts and switches should make use of insulated (plastic) knobs. In practical use, no metallic part of an "ac'de" chassis should be exposed to touch, accidental or otherwise, When such circuits are tested outside of their cabinets, a line isolation transformer such as the RCA WP-25A Isotap should

Performance of these circuits depends as much on the quality of the components selected and the care employed in layout and construction as on the circuits themselves. Good signal reproduction from receivers and amplifiers requires the use of good-quality speakers, transformers, chokes, and input sources (microphones, phonograph pickups, etc).

Coils for the receiver circuits may be purchased at local parts dealers by specifying the characteristics required: for f coils, the circuit position (antenna or interstage), tuning range desired, and tuning capacitances employed; for if coils or transformers, the intermediate frequency, circuit position (1st if, 2nd if, etc.), and, in some cases, the associated tube types; for oscillator coils, the receiver tuning range, the intermediate frequency, the type of converter tube, and the type of winding

The voltage ratings specified for capacitors are the minimum de working voltages required. Paper, mica, or ceramic capacitors having higher voltage ayout. However, if electrolytic capacitors having substantially higher voltage they may not "form" completely at the the effective capacitances of such units may be below their rated value. The wattmethods of construction that provide used (tapped or transformer-coupled), ratings than those specified may be used except insofar as the physical sizes of such capacitors may affect equipment ratings than those specified are used, operating voltage, with the result that age ratings specified for resistors assume adequate ventilation; compact installations having poor ventilation may require resistors of higher wattage ratings.

Circuits which work at very high frequencies or which are required to more than ordinary skill and experience handle very wide bandwidths demand in construction. Placement of component parts is quite critical and may require bypass capacitors must be kept short and must Correct circuit alignment and oscillator tracking may require the use of a cathode-ray oscilloscope, a high-impedance vacuum-tube voltmeter, and a signal erly modulated signal at the appropriate be properly dressed to minimize undesirable coupling and capacitance effects. generator capable of supplying a propfrequencies. Unless the builder has had considerable experience with broadband, high-frequency circuits, he should not undertake the construction of such cirleads to components including considerable experimentation. cuits.

and application on the characteristics and application features of each tube type are given in the TECHNICAL DATA FOR RCA RECEIVING TUBES SECTION. This information should be helpful in the understanding and utilization of the circuits.

= Circuits =

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PORTABLE 3-WAY SUPERHETERODYNE RECEIVER

(22-2)

PORTABLE BATTERY-OPERATED SUPERHETERODYNE RECEIVER

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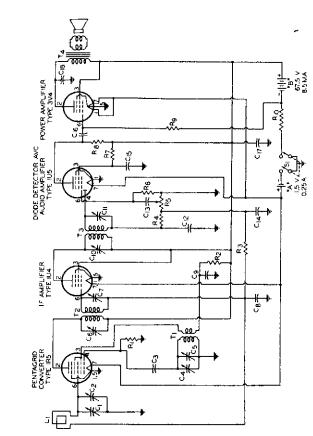
TO CHASSIS - DO NOT

POWER AMPLIFIER TYPE 3V4

DIODE DETECTOR, AVC., AUDIO AMPLIFIER TYPE IUS

IF AMPLIFIER TYPE ITA

RF AMPLIFIER TYPE IT4



C₁ C₄ = Ganged tuning capacitors: C₁, 10-274 pf; C₃, 7,5-1<u>22.5</u> pf

C.s=0.0022 µf, paper, 600 v.
L=Loop attenna or ferriterod autenna, 540-1600 Kc
(with specified values of
capacitance for C, and C=1
R=0.1 megohm, 0.25 watt
R=3.3 megohms, 0.25 watt
R₁ = 58000 ohms, 0.25 watt
R₂ = 58000 ohms, 0.25 watt
R₃ = 58000 ohms, 0.25 watt
R₄ = 58000 ohms, 0.25 watt
R₅ = 4.7 megohms, 0.25 watt
R₆ = 4.7 megohms, 0.25 watt
R₈ = 4.7 megohms, 0.25 watt
R₈ = 4.7 megohms, 0.25 watt
R₈ = 4.7 megohms, 0.25 watt

R₁₃ = 390 ohms, 0.25 watt
S₁ = Switch, double-pole, singlethrow with tuning capacitor of
T₁ = Oscillator coil for use
with tuning capacitor of
T₂ = Intermediate-frequency
transformer
T₂ T₁ = Intermediate-frequency
transformers, 455 Kc
(permediate-frequency
transformers, 455 Kc
T₁ = Output transformer for
may be used)
T₁ = Output transformer for
matching impedance of voice
coil to 10000-ohm tube load

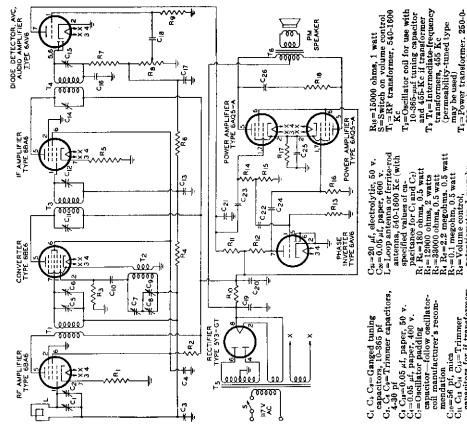
Li=Loop antenna or ferrite-rod artenna, 540-1800 Kc (with specified values of capecified valu

Ris = 1500 ohms, 0.25 watt
Ra = 1800 ohms, 10 watta
Ra = 2800 ohms, 10 watta
Si = Switch, 4-pole doubleSi = Switch, 4-pole doubleSi = Switch, double-pole, singleThrow
T, = Re transformer, 540-1600
Tz = Oscillator coil for use with
a 560-uning capacitor, and 455 Kc
if transformer, 455 Kc
transformers, 455 Kc
transformers, 455 Kc
transformers, 455 Kc
may be used)
T, = Output transformer for
may be used)
T, = Output transformer for
matching impedance of voice
coil for 16000-ohm tube load

Cis = 20.2 µf, paper, 400 v.
Cis = 26.2 µf, paper, 400 v.
Cis = 0.1 µf, paper, 400 v.
Cis = 0.65 µf, paper, 200 v.
Cis = 0.65 µf, paper, 200 v.
Cis = 0.65 µf, paper, 200 v.
Cis = 0.60 µf, paper, 400 v.
Cis = 0.60 µf, paper, 400 v.
Cis = 0.60 µf, paper, 25 v.
Cis = 20.60 µf, paper, 25 v.
Cis = 20.60 µf, electrolytic, 25 v.
Cis = 20.61 µf, electrolytic, 26 v. 4.30 pf C. f. in the capacitors, 4.30 pf C. f. in cl. s. f. in cl. s. f. in cl. s. f. in cl. s. f. in cl. s. f. in cl. s. f. c. c. f. in cl. s. f. c. f. f. in c. c. f. in c. f. f. in c. f. s. f. in c. f. s. f. in c. f. s. f. in c. f. in c. f. s. f. in c. f. s. f. in c. f. s. f. in c. f. s. f. in c. f. s. f. in c. f. s. f. in c. f. in C. C. C. C. Ganged tuning capacitors, 20-450 pf C. C. C. Trimmer capacitors,

= Circuits =

AC-OPERATED SUPERHETERODYNE RECEIVER



C: C: C: C:=Ganged tuning capacitors, 10-365 pf C: C: C: C:=Trimmer capacitors, 4-30 pf

Ci Cin-0.05 μ i, paper, 50 v. Ci=0.05 μ i, paper, 400 v. Ci=0.05 μ i, paper, 400 v. Ci=0.06 paper, 200 v. capacitor—follow oscillatoroll manufacturer's reconcoll manufacturer's recom-

Cueffe pf, mica of Cu Cy Cy Cy=Trimmer capacitors for if transformers Cu Cy=180 pf, mica Cu Cy=20 pf, mica Cu Cy=20 pf, electrolytic, 450 v. Cy=20 pf; mica Cy=20 pf; mica Cy=20 pf; mica

potentiometer, I megohm R R. R. H. = I On megohm 8. R. R. = 18. On egohms, 0.5 watt R. R. R. R. = 0.22 megohm, 0.5 watt R. R. R. R. = 0.47 megohm, 0.5 watt R. E. 200 ohms, 0.3 watt R. = 270 ohms, 6 watts

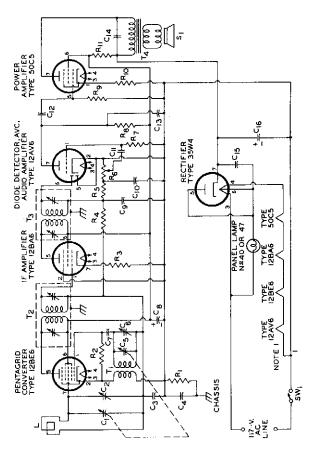
 R_{is} =15000 ohms, 1 watt S=Switch on volume control T_1 = RF transformer, 540-1600 Kc

T₂=Oscillator coil for use with 10.365-grid tuning capacitor and 455-Ke if transformer T₂ T₁=Intermediate-frequency transformers, 455 Kc (permeability-tuned type may be used)

T₂=Power transformer, 250-0. Z50 voluput transformer Corrections and Corrections and Corrections and Corrections are a 1000-one and correcting impedance of voice coil to a 1000-one plate-to-plate tube load

(22-4)

AC/DC SUPERHETERODYNE RECEIVER



C2-P1 (included capacitor, 4-30 pt (2-16-0.06 pt), paper, 50 v. C. = 0.1 µt, paper, 400 v. C. = Trimmer capacitor, 2-17 pt (7-56 pt, ceramic capacitor, 2-17 pt (5-56 pt, ceramic Cn. C. = 0.00 pt, paper, 400 v. C. = 0.00 pt, paper, 400 v. C. = 0.00 pt, paper, 400 v. C. = 0.00 pt, paper, 400 v. C. = 0.00 pt, paper, 400 v. C. = 0.00 pt, paper, 400 v. C₁ C₄=Ganged tuning capacitors; C₁, 10-365 pf; C₂, 7-115

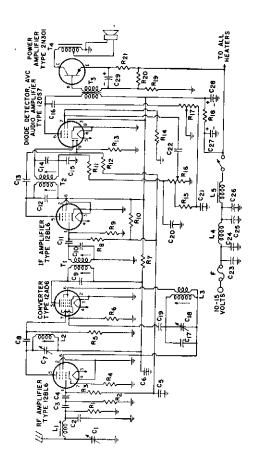
pacitance for C, and C3.
pacitance for C, and C3.
R= 0.22 megohm, 0.5 watt
R=30000 ohms, 0.5 watt
R=3. megohns, 0.5 watt
R=3.7000 ohms, 0.5 watt
R=Volume control, potenticmeter, 0.5 megohn
R=4.7 megohns, 0.5 watt
R, R,=0.47 megohm, 0.5 watt Cis=50 µf, electrolytic, 150 v. L=Loop antenna or ferrite-rod antenna, 540-1600 Kc (with specified values of ca-

Ru=150 ohms, 0.5 watt
Ri=1200 ohms, 1 watt
Ti=0scillator coil for use with
7-15-µg funing capacitor
and 455-Kc intermediatefrequency transformer
T2 T3=Intermediate-frequency
transformers, 455 Kc
(permeability-tuned type

may be used?
T.=Output transformer for
matching impedance of voi
coil to 2500-ohm tube load

NOTE 1: The following tube types are recommended for a 100-ma-heater tube complement: 18FX6A converter, 18FW6A if amplifier, 18FY6A detector and audio amplifier, 34GD5A power amplifier, and 36AM3B rectifier.

AUTOMOBILE RECEIVER



C., C., C.s.=Ganged tuning capacitors; C., 7-100 pf; C., C.s.; 80-850 pf C., C., C.s., C.s. C.s. = 100 pf, mica.

C.=27 pt, mica C.=27 pt, mica C. C. C. C. C. D. Daper, 100 volts C., C. C., C. C., E. Trimmer Capacitors for if transformers C.=125 pt, mica C.=125 pt, mica C.=125 pt, mica C.=20066 st, paper, 100 volts C.=0.01 st, paper, 100 volts C.=0.01 st, paper, 100 volts C.=0.01 st, paper, 100 volts C.=0.01 st, paper, 100 volts C. C.=0.04 pt, paper, 100 volts C. C.=0.04 pt, paper, 100 volts C. C.=0.04 pt, paper, 100 volts

C₂₄, C₃₅=300 pf, mica $C_{27}=500 \mu f$, electrolytic, 25 v. $C_{27}=500 \mu f$, electrolytic, 25 v. $C_{27}=500 \mu f$, electrolytic, 3 v. $F=F_{18}e_{15}$, 5 a. $L_{1}=Antenna$ Coil for use with C_{1}

Le=RP coil for use with C.
Li=Desdiator coil, tapped, for
use with Cis, and 262.5-Kc
if transformer
Li=RF choke, Ja
Li=RFler choke, J0 mh., 5 a.
Ki=0.56 megohm, 0.5 watt
Rk=0.56 megohm, 0.5 watt
Rk=150 ohms, 0.5 watt
Rk=110 ohms, 0.5 watt
Rk=3 megohm, 0.5 watt
Rk=3 megohm, 0.5 watt
Rk=3 megohm, 0.5 watt
Rk=3 megohm, 0.5 watt
Rk=3 megohm, 0.5 watt
Rk=3 megohms, 0.5 watt
Rk=3 ks, Rk=4.7 megohms,
0.5 watt

Ru=22 megohms, 0.5 watt Ri=4(700 ohms, 0.5 watt Ri=2000 ohms, 0.5 watt Ri=8200 ohms, 0.5 watt Ri=Volume control, potentiometer, 1 megohm tapped at 0.3 megohm Ri=1 one control,

Ris=220 ohms, 1 watt

Ris=250 ohms, 1 watt

Ris=15 ohms, 0.5 watt

Ris=1 ohm, 1 watt

Ris=1 ohm, 1 watt

Ris=1 ohm, 1 watt

Ris=1 ohm, 1 watt

Ris=1 ohm, 1 watt

Ris=1 ohm, 1 watt

Ris=1 ohm, 1 watt

Ti=IF input transformer,

Ti=IF input transformer,

Ti=IF output transformer,

Ti=A udio driver transformer;

impedance of primary, 2200

ohms; of secondary, 10

ohms; of resistance of primary, 20

primary current, 15 ms. dc.

Ti=A udio output transformer;

impedance of primary, 20

ohms, of secondary, 4 ohms;

ohms, of secondary, 4 ohms;

ohms, of secondary, 4 ohms;

ohms, of secondary, 4 ohms;

ohms, of secondary, 4 ohms;

ohms, of secondary, 4 ohms;

ohms, of secondary, 6.5 anperes of primary, 20

ohms max.; primary current, 6.5 anperes of primary, 20 potentiometer, 1 megohm

C. C.= 0.1 µf, paper, 400 v.
C. C.= 100 pf, mics, 500 v.
C. C.= 20 µf, electrolytic,
450 v.
C.= 25 µf, electrolytic, 50 v.
C.= 25 µf, electrolytic, 25 v.
C.= 25 µf, electrolytic, 25 v.
C.= 0.00 ½ µf, paper, 400 v.
C.= 0.01 µf, paper, 400 v.
C.= 0.00 µf, paper, 400 v.
C.= 60 pf, silver mics, 300 v.
C.= Ganged or split-stator uming capacitor; 10 pf max. per section. Cis = 0.006 µf, mica, 300 v. Cis = Quench-frequency control, trimmer capacitor, 3-30 pf,

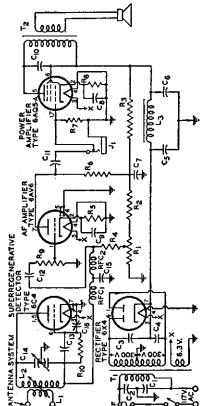
F=Fuse, 0.5 ampere
Ji=Jack for earphones
Li La fittansformer; Li,
I turn No. 18 Enam. wire;
La, 4 turns of No. 12 Enam.
copper wire on a ½". LD.
form (144 Me); adjust spac-

ohns, 1 watt, wire wound R₂ R₃ = 47000 ohns, 1 watt R₄ = 27000 ohns, 0.5 watt R₅ = 2700 ohns, 1 watt ing to set band L₃= Filter choke, 12 henries, 70 ma. R_i = Potentiometer, 50000

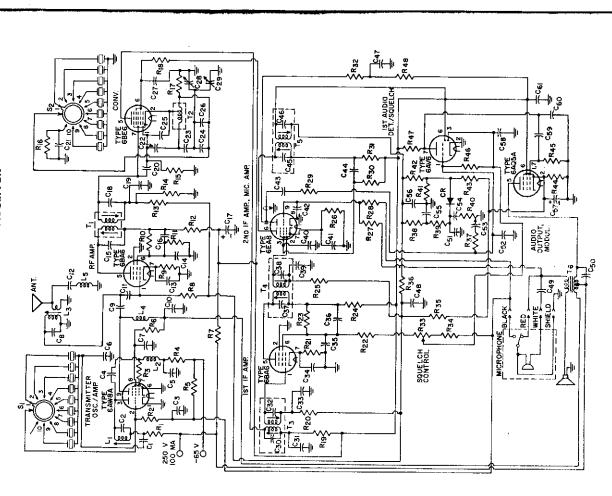
R₀ R₁=0.1 megohm, 0.5 watt
R₈ = 270 ohms, 1 watt
R₈ = 70 ohms, 1 watt
R₉ = Volume control, potentiometer, 0.5 megohm
R₀ = 4.7 megohms, 0.5 watt
R₀ = 4.7 megohms, 0.5 watt
R₀ = 6.7 megohms, 0.5 watt
R₀ = 6.7 megohms, 0.5 watt
R₀ = 5.7 megohms, 0.5 watt
R₀ = 6.8 megohms, 0.5 watt
R₁ = 7 megohms, 0.8 mh,
T₁ = Fower transformer,
S90-0.300 voite ransformer,
6.3 voits, 1.5 amperes
6.3 voits, 1.5 amperes
7.2 -Output transformer for
matching impedance of voice
coil to 5000-ohm tube load

NOTE: The use of an r! amplifier is recommended to minimize radiation from the superregenerative detector.

144-Mc SUPERREGENERATIVE RECEIVER



CITIZENS-BAND TRANSCEIVER



CITIZENS-BAND TRANSCEIVER (Cont'd)

0.5 wait

Ra=56 bins, 0.5 wait

Ra=560 bins, 0.5 wait

Ra=5600 bins, 0.5 wait

Ra=5600 bins, 1 wait

Ra=5600 bins, 2 waits

Ra=100 bins, 2 waits

Ra=100 bins, 2 waits

Ra=27000 bins, 1 wait

Ra=27000 bins, 2 waits

Ra=27000 bins, 1 wait

Ra=27000 bins, 1 wait

Ra=27000 bins, 1 wait

Ra=27000 bins, 1 wait

Ra=27000 bins, 1 wait

Ra=22 magohins, 0.5 wait

Ra=32 bins, 0.5 wait

Ra=1500 bins, 1 wait

Ra=1500 bins, 1 wait

Ra=1600 bins, 1 wait

Ra=1600 bins, 1 wait

Ra=1600 bins, 1 wait

Ra=1600 bins, 1 wait

Ra=1600 bins, 1 Ra=160 C₁₂ C₂₄ C₂₄ = 200 pf, mica, 500 v. C₂₄ = 10 µf, electrolytic, 50 v. C₅₆ = 150 pf, mica, 500 v. C₇₈ = Diode, IN34 L. = Oscillator coil, transmitter, RC₄ stock No. 225183 or Le Lu La 500 µf, rf choke
La-Fowner-amplifier coil, RCA
stock No. 226184 or equiv.
La-End-harmonis trap, RCA
stock No. 226187 or equiv.
R. Re, Re, Re, Res-47000 ohms, C=22 pt, ceramic, 500 v.
C=270 pt, mics, 500 v.
C=52 pt, mics, 500 v.
C=52 pt, mics, 500 v.
C=52 pt, mics, 500 v.
C=55 pt, ceramic, 500 v. N750
C=56 pt, ceramic, 500 v. N380
C=0.015 pt, paper, 400 v.
C=1 Variable, 23-15 pt
C=1 Variable, 1.5-10 pt,
C=1 variable, 1.5-10 pt, C45 C41 = 100 pi, ceramic, 500 v. C45 C45 = Part of T5 C4 = 3300 pi, paper, 600 v. Ca Cas = Part of Ta Car Cas = Part of Ta Cas Cas Cas Cas Cas Cas = 5000 pf, ceramic, 500 v.

0.5 watt

Ras=160 chms, 0.5 watt

Ras=160 chms, 0.5 watt

Ras=0.68 megohm, 0.5 watt

Ras=68000 chms, 2 watts

Ras=88000 chms, 2 watts

Ras=8 megohm, 0.5 watt

Ras=3 megohm, 0.5 watt

Ras=1 megohm, 0.5 watt

Ras=1 megohm, 0.5 watt

Ras=2 megohm, 0.5 watt

Ras=8.2 megohm, 0.5 watt

Ras=8.2 megohm, 0.5 watt

Ras=8.2 megohm, 0.5 watt

Ras=8.2 megohm, 0.5 watt

Sas=Rotary switch, channel

select transmit, RCA stock

No. 226189 or equiv.

Sas=Rotary switch, channel

select receive, RCA stock

No. 226189 or equiv.

T)=RF interstage transformer,

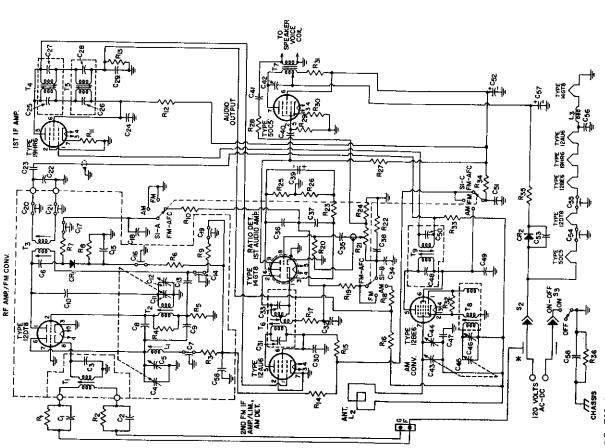
RCA stock No. 226191 or equiv. T₂=Oscillator coil, receiver RCA stock No. 226192 or equiv. $T_3T_4T_6 = IF$ transformers, RCA stock No. 226193

or equiv.

T₆ = Output and modulation transformer, RCA stock
No. 226194 or equiv.

NOTE: See general considerations for construction of high-frequency and broad-band circuits on page 504.

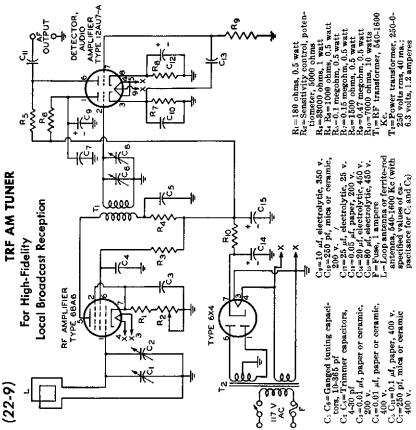
AM/FM RECEIVER



* On FM, the acline serves as an FM antenna by means of a special line cord having a third wire which is not physically connected to the line.

NOTE: See general considerations for construction of high-frequency and broadband circuits on page 504.

= Circuits =



C₁ $C_{11} = 0.1$ μ f, paper, 400 v. C₁=250 pf, mica or ceramic 400 v.

200 v. Cn=25 µl electrolytic, 25 v. Cn=25 µl electrolytic, 50 v. Cn=20 µl, electrolytic, 450 v. Cn=80 µl, electrolytic, 450 v. F=Rvae, I amper a ferrite-rod antenna, 540-1600 Kc (with specified values of expecified values of expecified values of co.

Parts List for AM/FM RECEIVER

Ca. C.₁₇ C.₁₈ C.₁₈ C. 0. 14, ceramic, 500 v.
Ca. Ca.=330 pt, mica, 500 v.
Ca.=0.01 µt, paper, 200 v.
Ca.=500 pt, ceramic, 50 v.
Ca.=500 pt, ceramic, 50 v.
Ca.=600 pt, ceramic, 50 v.
Ca.=6.022 µt, paper, 200 v.
Ca.=0.022 µt, paper, 200 v.
Ca.Ca.=Ganged tuning
apparitors, tune Ts to 5401650 K_C C.=Fart of R. C.=Fart of R. C.=36 pf, ceramic, 500 v. C. C., =Ganged tuning ca-gacitons, tune L. and T. to 88-108 Mc C. C. = 6.8 pf, ceramic, 500 v., Cs Ctg=Trimmer capacitors, 1-7 pf

Ris Ras = 1000 ohms, 0.5 watt Ris = 3.3 megohms, 0.5 watt Ras = 4.7 megohms, 0.5 watt Ras = Volume-control potenti

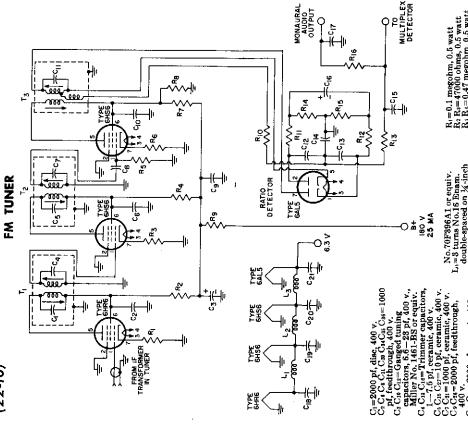
C, Cis. Cis=1000 pt, feed-through 500 v.
Ci=11 pt, ceramic, 500 v.
Ci=11 pt, ceramic, 500 v.
Cis=21 pt, ceramic, 500 v.
Cis=200 pt, ceramic, 500 v.
Cis=500 pt, feedthrough, 500 v.
Cis=0.22 pt, ceramic disc, 500 v.
Cis=2.22 pt, ceramic disc, 500 v.
Cis=2.22 pt, ceramic disc, 500 v.
Cis=2.2000 pt, feed-through, 500 v.

with cable capacitance, unter a truncal to 10.7 Mc tunes T to 10.7 Mc Ca=4700 pt, ceramic, 500 v. Ca Ca=2700 pt, ceramic, 500 v. Ca Ca=Part of T. Ca Ca=Part of T. Ca Ca=100 pt, ceramic, 500 v. MpO Ca Ca=100 pt, ceramic, 500 v. MpO Ca Ca=1000 pt, ceramic, 500 v. MpO Cos = 0.15 μ f, paper, 200 v. Cos Cos = 2 μ f, feedthrough, 500 v. Cos = Tuning capacitor; value,

 $C_{02}=60$ µf, electrolytic, 150 v. $C_{03}=0.047$ µf, paper, 400 v. $C_{03}=80$ µf, electrolytic, 150 v. $C_{03}=0.1$ µf, ergamic, 500 v. $C_{R_1}=A_FC$ crystal diode CR:=Silicon rectifier, 1N3756 C4 C46=Trimmer capacitors, 12 pf L2=Antenna, air loop with Cas Co - Part of To back cover $L_3 = 1 \mu f$, rf choke .ı = R.F coil

 $R_1 = 0.5$ megohm (includes C.) $R_2 = 0.5$ megohm (includes C.) $R_2 = 2200$ ohems, 0.5 watt $R_4 = 1200$ ohems, 0.5 watt R_5 $R_{11} = 83000$ ohems, 0.5 watt R_5 $R_{12} = 47000$ ohems, 0.5 watt R_1 $R_2 = 47000$ ohems, 0.5 watt R_1 $R_2 = 6.47$ megohm,

4 watts
Rae-0.22 megohn, 0.5 watt
Sa-8-0.22 megohn, 0.5 watt
Sa-8 witch, side, AM-FM-AFC
Sa-8 metode switch, 0N-OFF, part of R.1
I. - Antena transformer T_s = Ratio-detector transformer T_s = Audio output transformer T_s = Oscillator coil eter, I megohm, includes Ss Ru=82000 ohms, 0.5 watt Ra=820 ohms, 0.5 watt Ra=6800 ohms, 0.5 watt Ra=150 ohms, 0.5 watt Ra=150 ohms, 0.5 watt Ra=220 ohms, 0.5 watt Ra=220 ohms, 0.5 watt Ra=210 ohms, 0.5 watt Ra=210 ohms, 0.5 watt 2=Oscillator transformer 3 T · T · T · T == IF transformers



equiv.

Lo=135 turns No.16 Enam.
close-wound on 34-inch coil
form: slug 34-inch Moldite
No.5101 ferrite or equiv. double-spaced on 14-inch coil form; slug %-inch Moldite No.5101 ferrite or No.70F396A1 or equiv. L.=3 turns No.16 Epam.

180 V 25 MA

<u>1</u>6

No.5101 ferrite or equiv.
Ls=2.Ar, rf cboke, Ohnite
No.27144 or equiv.
Lr= RF col), 0.4 μh; 20 turns
No.28 Bram. Glose-wound
on 0.47-megohm, 0.5-watt
Allen-Bradley resistor or

Ca=6.8 pf, ceramic, 400 v. Ca=Part of Ta Ca Ca=2 pf, feedthrough, 400 v. Ca=Capacitor inserted in

place of tuning capacitor in secondary winding of T₂, value, with cable capacitance, tunes input to 10.7 Mc

Le Ly=1 µh, rf choke; 25 turns No. 24 Enam. close-wound on a 0.47-megohm, 1-watt Allen-Bradley resistor or resistor of equivalent resistor of equivalent physical size

L₁= 12 turns No.22 Enam. close-wound on K-inch coil form; slug ¾-inch Moldite No.5101 ferrite or equiv. L== 5 turns No.22 Enam. close-wound on ¼-inch coil form L₀=4 μl, rf choke, Miller

R₂ R_z=47(90 ohms, 0.5 watt R₃=5 ohms, 0.5 watt R₃=5 ohms, 0.5 watt R₃=2200 ohms, 0.5 watt R₉=220 ohms, 0.5 watt R₁₀=1200 ohms, 0.5 watt R₁₀=1500 ohms, 1.2 watt S₁=1500 ohms, 1 watt S₂=AM/FM range switch; open position is used for local stations, closed position for distant stations
TI=RF transformer; primary
2 turns No.32 wire with
type B nylon insulation,
Alpha No.1860 or equiv., spaced on M-inch coil form; slug %-inch Moldite No. 5101 ferrite or equiv. Tz=10.7-Mc if transformer; center-tapped; secondary 3 turns No.16 Enam. double-

 * A metal shield should be provided between the grid and plate terminals on the socket for the 6CW4. tuning capacitor in secondary removed and replaced by Cg

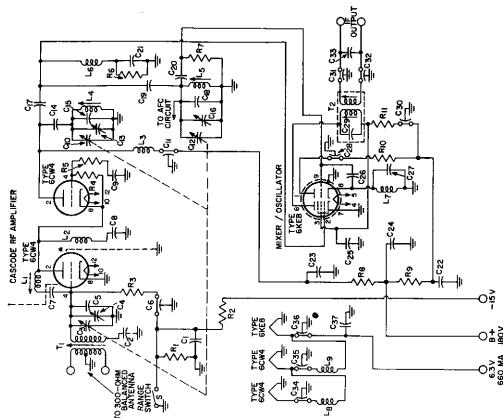
 $C_1C_4 = Part$ of T_1 $C_2C_6 = 2200$ pf, ceramic disc,

= Circuits

(22-11)

THREE-STAGE IF AMPLIFIER/LIMITER AND DETECTOR

For Monaural or Stereo Tuner



R.=15000 ohms, 0.5 watt R.=2200 ohms, 0.5 watt R.=2200 ohms, 0.5 watt R.=320 ohms, 0.5 watt R.=390 ohms, 0.5 watt R.=800 ohms, 0.5 watt T. R. R.=6800 ohms, 0.5 watt T.=IF transformers T.=Ratio-detector transformer NOTE: Tube shields may be required if regeneration is encountered. See general considerations for construction of high-frequency and broadband circuits on page 504. C₁₁ = Part of T₃
C₁₂ C₁₄ C₁₄ = 380 pd, ceramic
disc, 400 v.
C₁₆ = 100 pf, ceramic disc, 400 v.
C₁₆ = 2 pf, electrolytic, 400 v.
C₁₇ = 2 0000 pf, ceramic disc. L₁ L₂ L₃ = 1 µh R₁ R₃=68 ohms, 0.5 watt R₂ R₄ R₁₃=3800 ohms, 0.5 watt R₅=0.1 megohm, 0.5 watt $C_3=50$ μ , electrolytic, 450 v. $C_5C_7=Part$ of T_2 for $C_5=4T$ pl. ceramic disc, 400 v. C_5C_1S C_1S C_2S 10=1500 pf, ceramic disc,

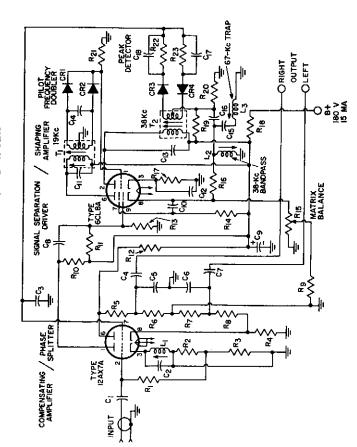
band circuits on page 504.

NOTE: See general considerations for construction of high-frequency and broad-

If an AFC network is included, C.1s must be decreased by the capacitance loading the oscillator tank.

(22-12)

FM STEREO MULTIPLEX ADAPTER



C1 C4 C7 C12 C14 C17 C18=0.01 Af, ceramic, 500 v. C2 C11=2200 pf, film, 500 v., N150

Cs=470 pf, ceramic, 500 v.
Cs.Ca=270 pf, ceramic, 500 v.
Tr50
Cs=0.047 µf, paper, 200 v.
Cs=0.40 µf, electrolytic, 450 v.
Cs=0.22 µf, paper, 400 v.
Cs=0.22 µf, paper, 400 v.
N.150

Ci=1000 pf, film, 500 v., N150 Ci=3800 pf, ceramic, 500 v. CR, CR, CR, CR, Crystal diodes, RCA stock No.11207

watt R₁₀=68000 ohms, 0.5 watt R₁₁=3.9 megohms, 0.5 watt R₁₃=1 megohm, 0.5 watt R₁₄=10000 ohms, 0.5 watt watt R; R; R; R;=0.1 megohm, 0.5

NOTE: See general considerations for construction of high-frequency and broad-

band circuits on page 504.

R.s=Potentiometer, balance control, RCA stock No. 111644 or equiv. R.s=4700 ohms, 0.5 watt R.s=1.2 megohms, 0.5 watt Rs=1.2 megohms, 0.5 watt Rs=0.15 megohm, 0.5 watt Rs: Rs=0.15 megohm, 0.5 watt T,=Transformer, 19-Kc, RCA

stock No.111045 or equiv. T₂= Transformer, 38-Kc tank, RCA stock No. 111046 or

R₁=10000 ohms, 0.5 watt
R₁=0.82 megohn, 0.5 watt
R₂=820 ohms, 0.5 watt
R₃=0.22 megohn, 0.5 watt
R₄=15000 ohms =5 per
cent, 2 watts
R₅=3900 ohms, 2 watts
R₅=3900 ohms, 0.5 watt
R₁ R₂=1000 ohms, 0.5 watt
R₁ R₂=100 ohms, 0.5 watt
R₁=8200 ohms, 0.5 watt
R₁=8200 ohms, 0.5 watt
R₁=68000 ohms, 0.5 watt
R₁=68000 ohms, 0.5 watt
R₁=6700 ohms, 0.5 watt
R₂=4700 ohms, 0.5 watt
R₂=4700 ohms, 0.5 watt
R₂=4700 ohms, 0.5 watt

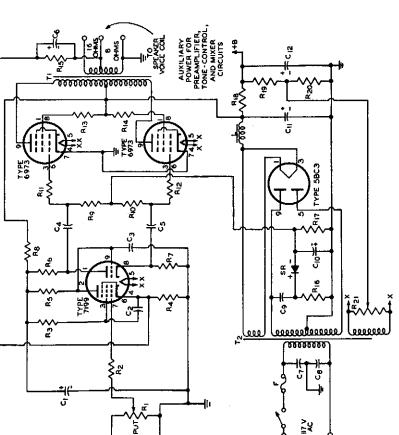
R.; = Hum balance adjustment, obtentiometer, 100 ohms, 0.5 wat wat Seesimm rectifier, 20 ma., 185 voltar sme frame fraint and fraving Seohm tap for feedback connection) for matching impedance of voice coil to 6600-ohm plate-to-plate tube load; 50 watts; frequency response, 10 to 6000 cps.

T. = Power transformer, 860-0-360 volts rms, 120 ma.; 5.8 v., 3.5 a; 5v., 3a.

(22-13)

HIGH-FIDELITY AUDIO AMPLIFIER

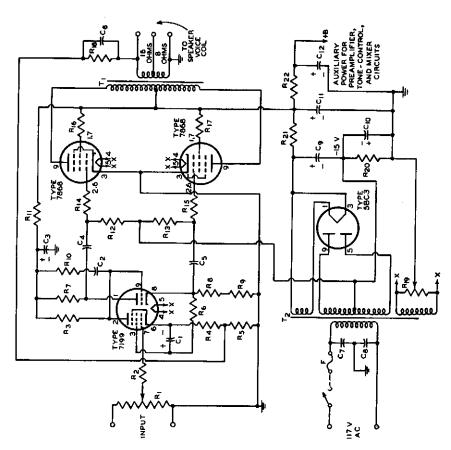
Class AB₁; Power Output, 15 Watts



 $C_3=40$ µf, electrolytic, 450 v. C_2 Ct Ct $C_5=0.25$ µf, paper, 400 v. Cs=3.3 pf, ceramic or mica, 600 v. C: C₃=0.05 µf, paper, 400 v. C₅=0.02 µf, paper, 600 v. C₁₀=100 µf, electrolytic, 60 v. C₁₀=80 µf, electrolytic, 450 v. C₁₀=80 µf, electrolytic, 450 v. F=Fuse, 3 amperes L=Choke, 3 h., 160 ma., de resistence 75 ohns or less R;=Volume control, potentioneter, 1 megohm C₆=150 pf, ceramic or mica, 400 v.

HIGH-FIDELITY AUDIO AMPLIFIER

Class AB₁; Power Output, 30 Watts



 $C_1=25$ µf, electrolytic, 50 v. $C_2=22$ pf, ceramic or mica, 600 v.

Ci=80 uf, electrolytic, 450 v Ci-Ci=0.25 uf, paper, 600 v. Ci=0.01 uf, paper, 600 v. Ci-Ci=0.05 uf, paper, 600 v. Co-Ci=40 uf, paper, 600 v. 500 v.

Co=100 \(\mu f\), electrolytic, \(50\) v. \(\cdots = 20\) \(\mu f\), electrolytic, \(450\) v. \(F = Fuse, \) \(3\) amperes, \(150\) v. \(R_1 = Volume control, potentionetr, \) Inegon meter, \(1\) megon watt

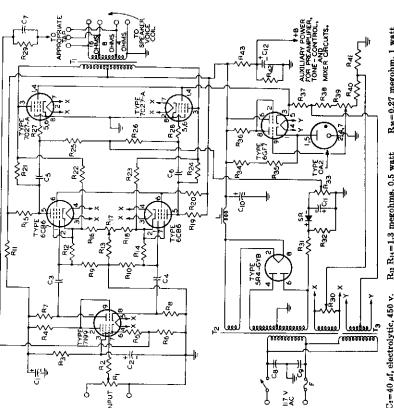
R₃=0.22 megohm, 0.5 watt R₄=820 ohms, 0.5 watt R₅=10 ohms, 0.5 watt R₈=0.18 megohm, 0.5 watt R₇=15000 ohms = 5 per cent, U.O watt Re=1000 obras, 0.5 watt Ru=22000 obras, 0.5 watt Ru=2000 obras, 2 watts Ru Ru=0.1 megoba, 0.5 watt Ru Ri=1000 obras, 0.5 watt Rs=270 obras, 0.5 watt Rs=270 obras, 0.5 watt Rs=15000 ohms=5 per cent, 0.5 watt

R.; = Hum balance adjustment, potentioneter, 100 ohms, 0.5 watt.
0.5 watt.
Rs = 120 ohms, 10 watts
Rs = 50 ohms, 10 watts
Rs = 10000 ohms, 2 watts
r = 0 upun transformer (having 16-ohm tap for feedback connection) for matching impedance of voice coil to 6600-ohm plate-fo-plate tube load; 50 watts; frequency response, 10 to 50000 eps.
T = Power transformer, 375-0-375 volts rms, 5 s.; 5 v., 3 s.

Circuits

(22-15)

HIGH-FIDELITY AUDIO AMPLIFIER Class AB₁; Power Output, 50 Watts



C: $C_1 = 40 \mu f$, electrolytic, 450 C: $C_1 = 0.02 \mu f$, paper, 400 v. C: $C_2 = 1 \mu f$, paper, 400 v. $C_7 = 0.002 \mu f$ to 4-ohm tap:

C.=0.002 µf to 4-ohm tap).
0.0015 µf to 16-ohm tap).
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0.001 µf to 16-oh

Ri. Ri. = 1.3 megohms, 0.5 watt Ris=47 ohms, 0.5 watt Ris=0.15 megohm, 0.5 watt Ris Ris=390 ohms, 0.5 watt Ri=AC balance control, potentiometer, 500 ohms,

Randolf and the Randolf and Ra

R_A=0.12 megohm, 5 watts R_B R_A R_A=33000 ohms, 2 watts R_A=Bisa adjustment, potenti-ometer 50000 ohms, Note 1 Rue Hum balance adjustment potentiometer, 100 ohms, Note 3

justment, potentiometer, 25000 ohms, 2 watts, Note 2 Ru-15000 ohms, 2 watts Ru-12000 ohms, 2 watts Ru-2000 ohms, 2 watts Ru-22000 ohms, 2 watts Ru-22000 ohms, 2 watts 135 voltarms Ti-Output transformer for Ra=0.27 megohm, 1 watt Ra=10000 ohms, 1 watt Ru=Screen-grid voltage ad-

matching impedance of voice coil to 5000-ohm plate-to-plate tube load; 50 watts; requency response, 10 to

50000 cps.

T=Power transformer, 600-0-600 volts rns, 200 ma., 6.3

V. 5 a.; 5 v., 8 a.

T>=Filament transformer, 6.3 volts, center tapped, NOTES: All of the following adjustments should be made before amplifier is placed into operation.

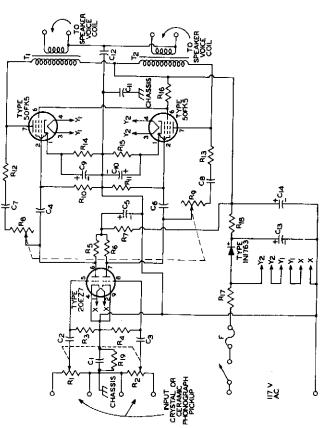
(1) With 5R4-GYB rectifier out of socket, adjust Ra for reading of -40 volts between junction of Ra, and Ra; and B- (ground bus). (2) With speaker connected, adjust Ra; for reading of 400 volts between pin 2 of 6GF7 and -B (ground bus). (3) With input shorted, adjust Ra; for minimum hum from speaker.

(4) With input open and volume control Ri set for maximum volume, adjust Ri; for minimum hum from speaker.

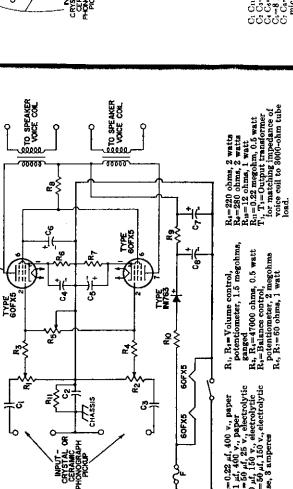
With Tone Control

Circuits

Power Output, 1 Watt Each Channel



TWO-CHANNEL STEREOPHONIC AMPLIFIER (22.17)



TWO-CHANNEL STEREOPHONIC AMPLIFIER

Power Output, 1 Watt Each Channel

C₁, C₁=0.22 µl, 400 v., paper C₂=0.1 µl, 400 v., paper C₄, C₂=60 µl, 25 v., electrolytic C₁=60 µl, 150 v., electrolytic C₇, C₈=60 µl, 150 v., electrolytic F=Fue, 8 amperes

>ջ

R., R.= Volume control, potentiometer, 1.5 megohms, ganged R., R.=47000 ohms, 0.5 watt R.= Balance control, potentiometer, 2 megohms R., R.=60 ohms, 1 watt

Bt Rz=Volume control, potentiometer, 2 megohms, ganged.
Rs Rx=10 megohms, 0.5 watt Rs Rz=0.22 megohm, 1 watt R:=0.022 megohm, 2 watt st Rs Rs=Tone control, potentiometer, 2 megohm, ganged.
Rs Rs=Tone control, potentiometer, 2 megohm, 0.5 watt Rs Rs=0.47 megohm, 0.5 watt Rs Rs Rs=0.22 megohm, 0.5 watt watt Rs Rs=0.22 megohm, 0.5 watt

RuRis=120 ohms, 2 watts
Ris=750 ohms, 2 watts
Ris=68 ohms, 2 watts
Ris=100 ohms, 10 watts
Ti Ty=0utput transformer for
matching impedance of voice
coil to 1000-ohm plate tube
load. Turns ratio 20 to 1;
primary current 90 ma, dc;
power-handling capacity,
3.5 watts mislimum.

TWO-CHANNEL AUDIO MIXER

Voltage Gain From Each Grid of 6EU7 to Output is Approximately 20

MICROPHONE AND PHONOGRAPH AMPLIFIER

= Circuits =

(22-20)

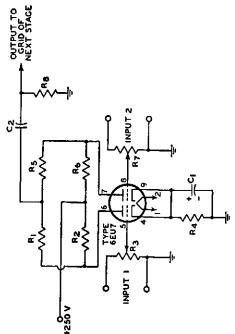
Power Output, 8 Watts

\$^{R₁₃ ± C₁₂}

TYPE 6AV6

+c2

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 $C_1=10 \mu f$, electrolytic, 25 v. $C_2=0.05 \mu f$, paper, 400 v.

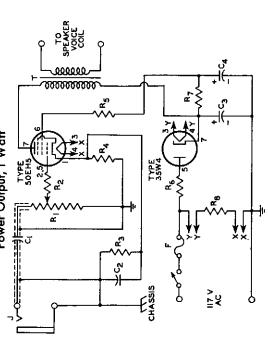
 R_1 R_2 R_3 =1 megohm, 0.5 watt R_2 R_5 =0.1 megohm, 0.5 watt

R₃ R₇= Potentiometers, 0.1 megohm, audio taper R₄=1200 ohms, 0.5 watt

(22-19)

PHONOGRAPH AMPLIFIER

Power Output, 1 Watt



C₁=0.02 µL, paper, 400 v.
C₂=0.082 µL, paper, 400 v.
C₃ C₄=40µL, electrolytic, 150 v.
F=Fuse, 1 ampere
J=Input connector, shielded, for crystal phonograph
pickup.

R₁=Volume control, potenti-ometer, 0.5 megohm, audio taper
R:=10000 ohms, 0.5 watt
Rs=0.22 megohm, 0.5 watt
Rs=656 ohms, 0.5 watt
Rs=22 ohms, 0.5 watt

R;=3300 ohms, 1 watt Rs=210 ohms, 10 watts T=Cutput ransformer for matching impedance of voice coil to 3000-ohm tube load.

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TREBLE

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 C_1 $C_2 = 100$ pf disc-ceramic,

300 v.

C₃=0.05 µf, paper, 200 v.

C₄=8 µf, electrolytic, 450 v.

C₅=26 µf, electrolytic, 450 v.

C₆=25 µf, electrolytic, 450 v.

C₇=0.1 µf, paper, 200 v.

C₈=0.001 µf, disc-ceramic, 300 v.

C₉=0.01 µf, disc-ceramic, 300 v.

C₉=10.01 µf, disc-ceramic, 300 v.

C₁=4700 µf, disc-ceramic, 300 v.

 $C_{12}=4$ μ f, electrolytic, 450 v. $C_{13}=0.05$ μ f, paper, 600 v. $C_{14}=25$ μ f, electrolytic, 25 v. C_{15} C_{15} $C_{17}=20$ μ f, electrolytic,

F=Fuse, I ampere

J.=Jack for high-impedance crystal microphone input; max. input: 2 millivolts peak, J.=Jack for crystal phono-pickup input; max. input: 0.5 volt peak. R. Res 10000 ohms, 0.5 watt R.=Volume Control, potenti-ometer. I megohms, 0.5 watt R.=Z. z megohms, 0.5 watt R.=Z. z megohms, 0.5 watt R.=Z. z megohms, 0.5 watt R.=Z. z megohms, 0.5 watt R. R.; Rn=C.22 megohm, 0.5

wait

R₀=27000 ohms, 0.5 watt

R₀=1200 ohms, 0.5 watt

K₁=1200 ohms, 0.5 watt

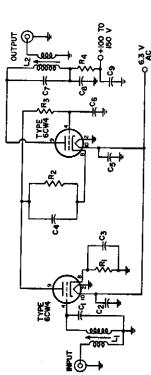
K₁=1 ohm engohm, 0.5 watt

R₂ R₁=2 one control, potentioneter, 0.5 megohm

R₁₀=22000 ohms, 0.5 watt
R₁₈=12000 ohms, 0.5 watt
R₁₈=1300 ohms, 0.6 watt
R₁₈=0.47 megobm, 0.5 watt
R₁₈=0.47 megobm, 0.5 watt
R₁₈=0.15 megohm, 0.5 watt
R₁₈=180 ohms, 1 watt
R₁₈=180 ohms, 1 watt
R₁₈=50 ohms, 1 watts
S₁₈=8 witch, SPDT
S₂=8 witch, SPDT
S₂=8 witch, SPDT
S₂=8 witch, SPDT
S₃=8 witch, SPDT
T₄=7 would be sent a single of sent a single witch
S₄=8 witch, SPDT
S₅=8 witc

PREAMPLIFIER FOR AMATEUR RECEIVER FOR 10-METER (30-MEGACYCLE) BAND

Power Gain, 25 to 35 db



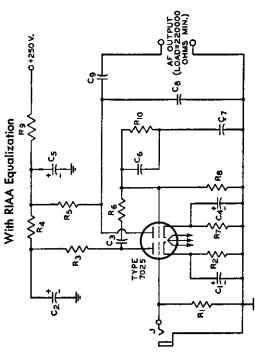
C1, C7=5 pf, 500 v., mica C2, C3, C4, C5, C5, C3, C3=0.001 df, 500 v., ceramic L1, L1=18 turns of No.32 Enam. copper wire wound

on ¼" I.D. slug-tuned form. Li tuned to 32 Mc; Li to 29.5 Mc; Input and output link, 1¼ turns. Input and output impedance, 75 ohms.

 R_1 , $R_2=100$ ohms, 0.5 watt $R_8=0.47$ megohm, 0.5 watt $R_4=1000$ ohms, 0.5 watt

(22-22)

PREAMPLIFIER FOR MAGNETIC PHONOGRAPH PICKUP



C: $C_1=25 \mu f$, electrolytic, 25 v. $C_2=20 \mu f$, electrolytic, 450 v. $C_3=0.1 \mu f$, paper, 600 v. $C_5=0.0083 \mu f \pm 5 per cent$,

paper, 600 v.
Cr=0.01 µf ± 5 per cent,
paper, 600 v.
Cs=160 pf ± 6 per cent,
ceranic or mica, 500 v.
(includes capacitance of
output cable)

J=Input connector, shielded, for high-impedance magnetic phono pickup (10 mv. output,

approx.)
Ri=Value depends on type of
magnetic pickup used. Follow pickup manufacturer's
recommendations.

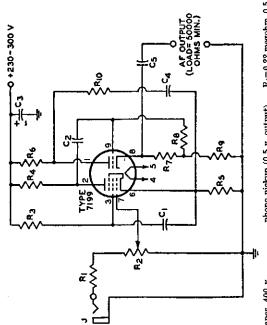
R: R:=2700 ohms, 0.5 watt R:=Rs=0.1 megolm., 0.5 watt R:=39000 ohms, 0.5 watt R:=0.47 megohm, 0.5 watt R:=0.68 megohm, 0.5 watt R:=15000 ohms, 1 watt R:=22000 ohms, 0.5 watt

Circuits =

(22-23)

PREAMPLIFIER FOR CERAMIC PHONOGRAPH PICKUP

Cathode-Follower (Low-Impedance) Output



C₁=0.1 µf, paper, 400 v. C₂=0.0 µf, paper, 400 v. C₃=0.0 µf, electrolytic, 400 v. C₄=0.25 µf, paper, 400 v. C₅=0.22 µf, paper, 600 v. C₅=1 mput connector, shielded, for high-impedance ceramic

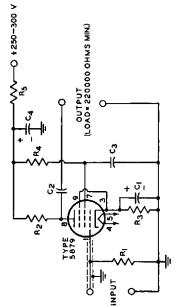
phono pickup (0.5 v. output)
Ri=1.8 megohms, 0.5 watt
Rz=Volume control, potentioneter, 0.5 megohm, audio taper $R_z=0.82$ megohm, 0.5 watt

 $R_s=0.22$ megohm, 0.5 watt $R_s=1000$ ohms, 0.5 watt R_t $R_0=47000$ ohms, 0.5 watt $R_t=4700$ ohms, 0.5 watt $R_t=1$ megohm, 0.5 watt $R_0=1800$ ohms, 0.5 watt

(22-24)

LOW-DISTORTION PREAMPLIFIER

For Low-Output High-Impedance Microphones



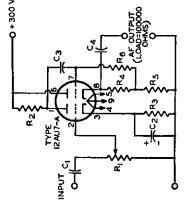
 $C_1=25~\mu L$, electrolytic, 25 v. $C_3=40~\mu L$, electrolytic, 450 v. $C_2=0.047~\mu L$, paper, 400 v. $R_1=22~\mu egohms$, 0.5 watt $C_2=0.12~\mu L$ paper, 400 v. $R_2=0.1~\mu egohm$, 0.5 watt Sensitivity=3 millivolts for output of 220 millivolts

 $R_3=1000$ ohms, 0.5 watt $R_4=0.47$ megohm, 0.5 watt $R_5=22000$ ohms, 0.5 watt

(22-25)

TWO-STAGE INPUT AMPLIFIER

Cathode-Follower (Low-Impedance) Output

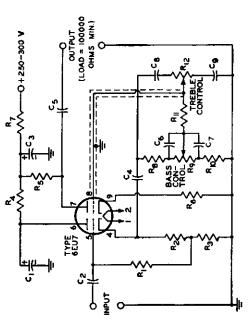


C₁ C₂=0.1 μt, paper, 400 v. C₂=25 μt, electrolytic, 25 v. C₄=0.5 μt, paper, 200 v.

R₁=Volume control, potenti-ometer, 0.5 megohn R₂=0.22 megohn, 0.5 watt

R, R=5600 ohms, 0.5 watt R=27000 ohms, 0.5 watt Re=0.56 megohm, 0.5 watt

BASS AND TREBLE TONE-CONTROL AMPLIFIER STAGE



C₁ C₃=20 μ f, electrolytic, 450 v. C₂=0.047 μ f, paper, 400 v. C₃=0.1 μ f, paper, 400 v. C₃=0.22 μ f, paper, 400 v. C₄=0.0022 μ f, paper, 400 v. C₅=0.0022 μ f, paper, 400 v. Ci=0.047 µt, paper, 400 v. Ct=0.14f, paper, 400 v. Ct=0.022 µt, paper, 400 v. Ci=0.022 µt, paper, 400 v. Ci=0.022 µt, paper, 400 v. Ci=220 pt, ceramic or mice, 500 v.

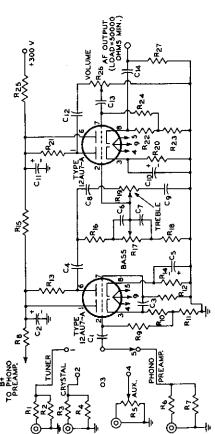
C₉=0.0022 µf, paper, 400 v. R. = 0.47 megohm, 0.5 watt R₂=1500 ohms, 0.5 watt R₃ R₂=15000 ohms, 0.5 watt R₄=22000 ohms, 0.5 watt R₄=22000 ohms, 0.5 watt R₃ R₃ R₁=0.1 megohm, 0.5 watt

ometer, 1 megohm R₁₀=10000 ohms, 0.5 watt R₁₂=Treble control, potenti-ometer, 1 megohm Re=1000 ohms, 0.5 watt Rr=Bass control, potenti-

(22-27)

AUDIO CONTROL UNIT

With Volume and Tone Controls



C₁ C₇=0.01 µf, paper, 400 v. C₂C₁₁=20 µf, electrolytic, 450 v. C₃C₄=0.1 µf, paper, 400 v. R₄ C₁₀=25 µf, electrolytic, 25 v. C₄=0.001 µf, paper, 400 v.

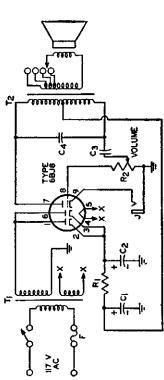
 $C_0 = 4700$ pt, mica, 300 v. C_{11} $C_{14} = 0.47$ μ t, paper, 400 $C_{13} = 0.033$ μ t, paper, 400 v. R_1 R_2 $R_2 = 0.27$ megohm, 0.5

megohm, audio taper
R_a=0.33 megohm, 0.5 watt
R₁R₂B₁=15000 ohms, 0.5 watt
R₁R₂B₂=15000 ohms, 0.5 watt
R₁R₂E₂D₂O ohms, 0.5 watt
R₁R₂=1 megohm, 0.5 watt
R₁R₂=1 megohm, 0.5 watt
R₁R₂=1 megohm, 0.5 watt

R₁₄=1200 ohms, 0.5 watt R₁₇ R₁₉=Potentiometers, 0.5

megohm, audio taper R_{18} =22000 ohms, 0.5 watt R_{26} =2700 ohms, 0.5 watt R_{27} =5600 ohms, 0.5 watt megohm, audio taper

CODE-PRACTICE OSCILLATOR



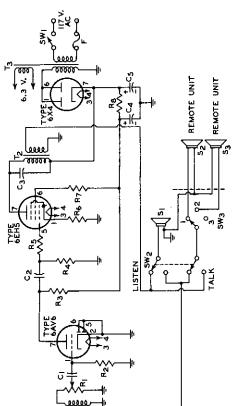
C; $C_3 = 20 \mu f$, electrolytic, 150 v. $C_4 = 0.001 \mu f$, paper, 200 v. $C_4 = 0.03 \mu f$, paper, 200 v. F=1/8 ampere

J=Input jack for key R₁=1500 ohms, I watt R₂=Potentiometer, 0.1 megohm, 0.5 watt T₁=Power transformer, 125

volts rms, 15 ma; 6.3 volts, 0.6 ampere T;=Output transformer, universal

NOTE: Select any two terminals of secondary of T: to give desired tone.

Sensitivity=0.5 volt rms for output of 1.25 volts with controls set for flat response.



C₁ C₂=0.0022 µf, paper, 200 v. I C₂=0.005 µf, paper, 200 v. F C₃ C₃=60 µf, electrolytic, 150 v. S F=Fuse, 1 ampere R₁=Volume control, potention-eter, 0.5 megohm, audio taper S

Re Ev=68 ohms, 0.5 watt
Re=2200 ohms, 1 watt
Si 25.51=Speaker, permanentmagnet, voice-coll impedance
34 ohms
r SWi=On-off switch, single-pole
single-throw, attached to volume control Ri,
SW=7alk-listen switch,
double-pole double-throw

ary Ts=Cutput transformer, 3000-ohm primary, 4-ohm secondary Ts=Power transformer, 125 volts rms, 50 ma., 6.3 volts

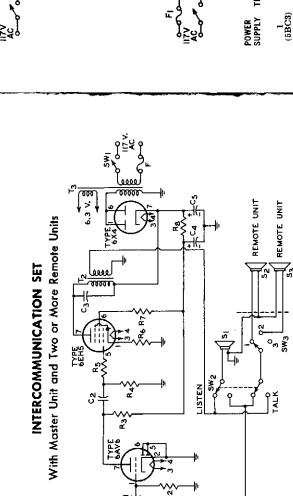
rms, 2 amperes

rotary T_i = Input transformer, 4-ohm primary, 25000-ohm second- $SW_2 = Station$ -selector switch,

taper R₂=6.8 megohms, 0.5 watt R₃:R₄=0.47 megohm, 0.5 watt R₃=10000 ohms, 0.5 watt

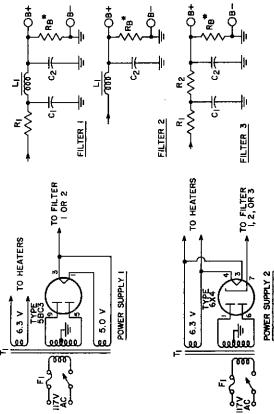
NOTES: The leads from the LISTEN-TALK switch to T₁ and T₂ should be kept as far apart as possible to prevent undesirable regeneration effects.

Connections to the remote speaker units should be made with low-resistance wire, preferably shielded "intercon" cable.



(22-30)

ALL-PURPOSE POWER SUPPLY



ř	₩	860 120	80 120 120
OUTPUT	VOLTS	360 320	233 230 212
	FILTER	ĭ	63
	స	40 µf 450 Vdc	
	ت	40 µf 450 Vdc	
	er E	1	
	ď	33 ohms 5W	
	CHOKE (L1)	140 ma, 7b, 165 obms	or equiv.
	TRANSFORMER		(300-0-300) or equiv.
POWER	SUPPLY	1 (5BC3)	

80 120	120 160 200	120 160 200	236
230 215	450 426 410	310 300 280	350 260 260
61	-	67	-
	40 µf 600 Vdc		40 µl 450 Vdc
	40 µf 600 Vdc		40 µf 150 Vdc
	l		500 ohms 500 ohms 40 µf 5W 3W 450 Vdc
	66 ohms 10W		500 ohms 5 W
	200 ma, 4h, 145 ohms Thorderson	20C54 or equiv.	80 ma, 12h, 375 ohms
or equiv.	Stancor PC or PM	(400-0-400) or equiv.	Stancor P-6358
			~3

300 260	250 230 220	345 300 250
1	67	es
40 µľ 450 Vde	'	
40 µľ 450 Vdc		
500 ohms 3 W		
500 ohms 5 W		
80 ma, 12h, 375 ohms Thordsteon	20C58 or equiv.	
Stancor P-6358 (300-0-300)	or equiv.	

(6X4)

240 | 240

$\frac{265}{225}$	$\frac{200}{180}$	260 220 180
1	2	ಣ
40 µf 450 Vdc	·	l
40 µf 450 Vdc		
500 ohms 40 µf 3W 450 Vdc		
500 ohms 5 W		
80 ma, 12b, 375 ohms Thorderson	20C53 or equiv.	
Stancor PM or PC	(240-0-240) or equiv.	
80 ma, 12b, 375 ohms		

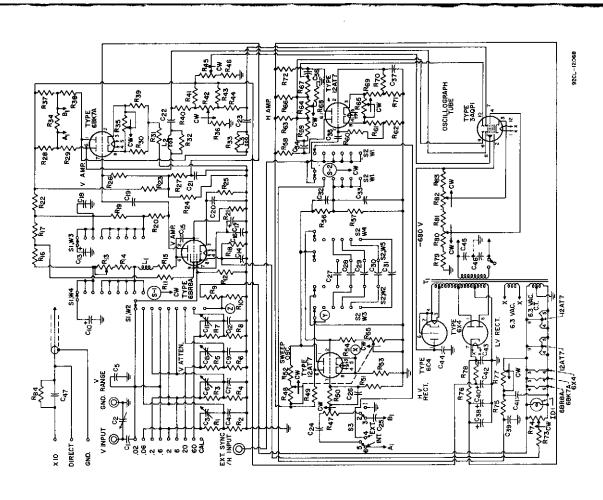
| 040 | 040 | 040 | 040

NOTE: Bleeder Rs can be omitted if an external load is permanently connected across the output terminals. Bleeder current should be approximately 10 per cent of the load current.

= Circuits =

(22-31)

CATHODE-RAY OSCILLOSCOPE



CATHODE-RAY OSCILLOSCOPE (Cont'd)

500 v. C₁₄=1200 pf, ceramic disc, 500 v.

Cas Cas Cas = 0.01 μ f, ceramic disc. 600 v. Ca = 0.5 μ f, paper, 1000 v. Ca = 12 pf, tubular ceramic,

150 v.
ID, = Pitot lamp, No.47
Li = Peaking coil, 20 mh
L. Li = Peaking coil, 38 mh
(wound on 10,000-ohm, 0.5-wattresistor) $R_1 = 0.68$ megohm, 0.5 watt

C. C. C. C. C. E. Trimmer capacitors, 4—40 pl, Arco No.422 or equiv. C. C. C. C. C. C. C. S. D. M, paper, 400 v. C. = 64 pl, ceramic disc, 500 v. C. = 22 pl, ceramic disc, 500 v. C. = 140 pl, ceramic disc, 500 v. C. = 140 pl, ceramic disc, 500 v. C. S. L. D. C. C. S. Z. D. M, elec-trolytic, 460 v. C. C. C. C. C. S. Q. M, elec-trolytic, 460 v. C. E. C. C. C. S. D. M, elec-trolytic, 460 v. C. E. C. C. C. S. D. M, elec-trolytic, 460 v.

C₁₁ C₂₄ C₂₅ = 0.02 µf, ceramic disc, 600 v. C₂₇ C₂₃ = 10 µf, electrolytic, 450 v. C₁₅ C₂₅ = 40 µf, electrolytic, 450 v.

equiv.

Ris=100 ohms, 0.5 watt

Ris=820 ohms, 1 watt

Ris=820 ohms, 1 watt

Ris=820 ohms, 1 watt

Ris=8200 ohms, 0.5 watt

Ris=120 ohms, 0.5 watt

Ris Ris=180 ohms, 0.5 watt

Ris Ris=100 ohms, 0.5 watt

Ris Ris=100 ohms, 0.5 watt

Ris Ris=100 ohms, 0.5 watt

Ris Ris=100 ohms, 0.5 watt

Ris Ris=100 ohms, 1 watt

Ris Ris=100 ohms, 1 watt

Ris Ris INC Ohms, 0.5 watt

Sayatts, INC Type PW5 or

Ras=6000 chms, 0.5 watt
Ras=1.2 megchm, 0.5 watt
Rat Ras Ras Ras=0.82 megchm,
0.5 watt
Ray Ras=Variable, 1 megchm, 0.5 watt
Ras Variable, 0.1 megohm,
0.25 watt
Ras 0.18 megohm, 0.5 watt
Ray 7.18 megohm, 0.5 watt
megohm, 0.5 watt

Res=0.1 megohm, 1 watt
Ra=3800 ohms, 0.5 watt
Ra=3800 ohms, 0.5 watt
Ra=6.27 megohm, 0.5 watt
Ra=8300 ohms, 0.5 watt
Ra=83000 ohms, 0.5 watt
Ra=83000 ohms, 0.5 watt
Ra=Variable, 5 megohms,
0.5 watt
Ra=Ra=2.7 megohms,
0.5 watt
Ra=3.3 megohms, 0.5 watt
Ra=3.3 megohms, 0.5 watt
Ra=2.00 ohms, 0.5 watt
Ra=Ra=2.00 ohms, 0.5 watt
Ra=Ra=2.00 ohms, 0.5 watt
Ra=Variable, 2 megohms,
0.5 watt 0.25 watt
R:s=4700 ohms, 0.5 watt
R:s=Wire-wound, 1500 ohms,
7 watts, IRC Type PW7 or Res Variable, 50000 ohms, $R_{73}=0.1$ megohm, 0.5 watt $R_{74}=Variable$, 10000 ohms,

equiv.

Rw=Variable, 0.5 megohm,
0.5 watt

Rs=Variable, 75000 ohms, 0.5

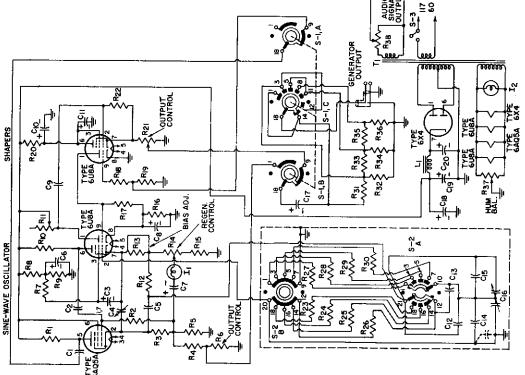
watt fincludes ac switch)
S₁=Rotary switch, vertical
range elector, 9 positions,
4 sections, RCA stock
0.0.21919 or equiv.
S₂=Rotary switch, horizontal
sweep selector, 6 positions,
5 sections, RCA stock No.
219200 or equiv.

219260 or equiv S_i= Switch, doft, syne, Stack-poie Type SS-33 or equiv T_i= Power transformer, 117 volts, 60 togs, R-CA stock No. 218122 or equiv. X, Y, Z, = Test points

NOTE: For home construction of this circuit, the complete Kit RCA-WO-33A (K) is recommended because of the large number of special components used. This circuit is also available in wired form as the RCA-WO-33A.

AUDIO SIGNAL GENERATOR (Cont'd)

AUDIO SIGNAL GENERATOR



 $C_1=0.1 \mu f$, ceramic, 400 v. $C_2 C_2=0.25 \mu f$ ceramic, 400 v. $C_3 C_6 C_7=20 \mu f$, electrolytic,

C4=Trimmer capacitor, 5—80 pf C5=1 μ f, paper, 200 v. C8 C17=40 μ f electrolytic, 150 v. C9=100 μ f, electrolytic, 150 v.

Cir Cis Call—3-action electron trolyfer 20 at 250 v; 60 pt, 450 v; 20 at 450 v. Cis 22 pt, evamic Cis 25 pt, evamic Cis 27; — 8 at trimmer Cis 27 pt, evamic 600 v. Cis 27 pt, evamic 600 v. Cis 27 pt, evamic 600 v. Cis 27 pt, evamic 600 v. $t_0 = 7.8 - 8 \mu f$, trimmer $t_0 = 27 \mu f$, ceramic, 600 v. $t_0 = Variable$, 2 gang; RCA stock No.220226 or equiv.

R₁₅=8200 ohms, 0.5 watt R₁₆=12000 ohms, 0.5 watt R₁₇=4700 ohms, 1 watt $R_{zy} = 8 \text{ m}$ $R_{zy} = 0.8$ Cis=50 µf, electrolytic, 250 v.

Is=Lamp, 9 watts, 120 v.

Is=Pilot lamp, No.47

No.22021 fo requiv.

Resident Rea stock
Resident Rea stock
Resident Rea stock
Resident Rea stock
Resident Rea stock
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 $R_{29} = 0.8$ megohm, 0.5 watt $R_{29} = 8000$ ohms, 0.5 watt $R_{20} = 8000$ ohms, 0.5 watt $R_{21} R_{22} R_{23} = 6200$ ohms, 0.5 watt $R_{22} R_{23} = 750$ ohms, 0.5 watt $R_{20} = 800$ ohms, 0.5 watt $R_{1}=0.47$ megohm, 0.5 watt $R_{1}=0.47$ megohm, 0.5 watt $R_{2}=0.27$ megohm, 0.5 watt $R_{2}=16000$ ohms, 2 watts $R_{2}=16000$ ohms, 2 watts $R_{2}=36000$ ohms, 0.5 watt $R_{2}=36000$ ohms, 0.5 watt $R_{2}=36000$ ohms, 0.5 watt $R_{2}=3.6$ megohms, 0.5 watt $R_{2}=3.6$ megohms, 0.5 watt $R_{2}=3.6$ megohms, 1.3 watt $R_{2}=3.6$ megohms, 1.3 watt

equiv.

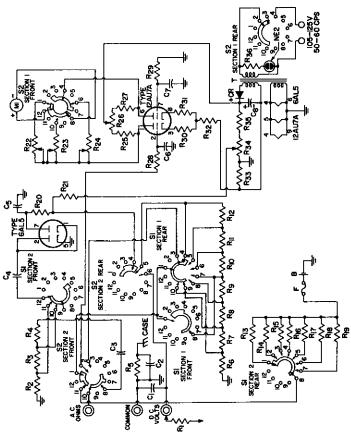
S₂=Rotary switch, range
selector, 4 position, 2 wafer,
RCA stock No.220217 or RCA stock No. 220216 or

R₁₇=Potentiometer, 100 ohms R₁₈=Potentiometer, 100 ohms, with switch S-3 S_=Rotary switch, function selector, 8 position, 3 wafer,

equiv. T_i=Power transformer, 117 volts rms, 60 cps, RCA stock No.220214 or equiv.

(22-33)

ELECTRONIC VOLT-OHM METER



 $C_1=470$ pt, ceramic disc, 1600 v. $C_2=0.001$ µt, ceramic disc, 500 v. $C_1=0.47$ µt, tubular, 400 v. $C_1C_2=0.02$ µt, ceramic disc, B=Battery, 1.5 v.

Cs.Cr=0.005 µf, ceramic disc, 200 v.
Cs=10 µf, electrolytic, 400 v.
F=Fuse, 0,5 ampere
CR=Scleinlum rectifier, Radio
Receptor Co. 48Y18 or equiv.
Ma. Meter, dic, 0-200 µs
NS:=Neon lamp
R.=DC-voltage probe isolating
R.=DC-voltage probe isolating
R.=B88000 ohms, 0.25 watt
R.=R88000 ohms, 0.25 watt
R.=R.=SR secon, 1 watt
R.=R.=I megohm, 0.25 watt
R.=R.=I megohm, 0.25 watt
R.=R.=I megohm, 0.25 watt
R.=R.=I megohm, 0.25 watt

R;=20000 ohms, 0.25 watt
R==70000 ohms, 0.25 watt
R==0.2 megohm, 0.25 watt
Ru=0.7 megohm, 0.25 watt
Ru=2 megohms, 0.25 watt
Ru=3 megohms, 0.25 watt
Ru=3 megohms, 0.25 watt
Ru=10 ohms, 0.25 watt
Ru=10 ohms, 0.25 watt
Ru=10 ohms, 0.25 watt
Ru=10 megohm, 0.25 watt
Ru=0.1 megohms, 0.25 watt
Ru=0.1 megohms, 0.25 watt
Ru=0.1 megohms, 0.25 watt
Ru=0.000 ohms, 0.25 watt
Ru=1000 ohms, 0.25 watt
Ru=1000 ohms, potentiometer, ac calibration, 0.5 watt
Ru=1000 ohms, potentiometer, ac calibration, 0.5 watt
Ru=1000 ohms, potentiometer, ac calibration, 0.5 watt
Ru=15000 ohms, potentiometer, ohms adjustnent,
0.25 watt

Rze=10000 ohms, potentiom-eter, zero adjustment,

Ras=8.3 megohms, 0.5 watt Ras=6.3 megohms, 0.5 watt Ras=1830 ohms, 0.5 watt Ras=15000 ohms, 0.5 watt Ras=27000 ohms, 0.5 watt Ras=27000 ohms, 0.5 watt eter, ac balance, 0.5 watt

efer, ac balance, 0.5 watt
Ra=4700 ohms, 0.5 watt
Ra=4700 ohms, 0.5 watt
Ra=4700 ohms, 0.5 watt
S=Range selector switch,
S=Range selector switch,
In 224 or equiv.
S=Function selector switch,
Dostiton, RCA stock No.
Z17224 or equiv.
Z17225 or equiv.
Z17225 or equiv.
Z17225 or equiv.
Z17225 or equiv.
Z17225 or equiv.

NOTE: Switches are shown in their maximum counterclockwise positions (S₁=1.5 v., R X 1; S₂="OFF"). For home construction of this or a similar circuit, the complete Kit RCA-WV-77E (K) or RCA-WV-98C (K) is recommended because of the large number of special components used.

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